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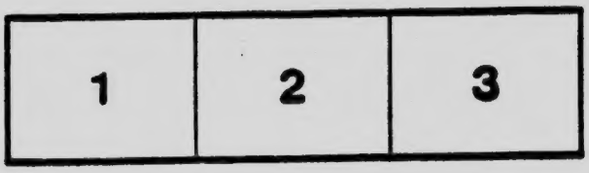

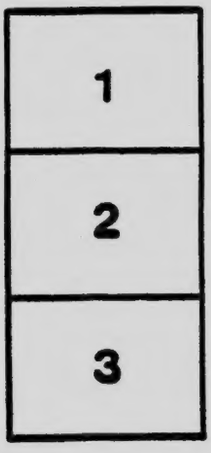

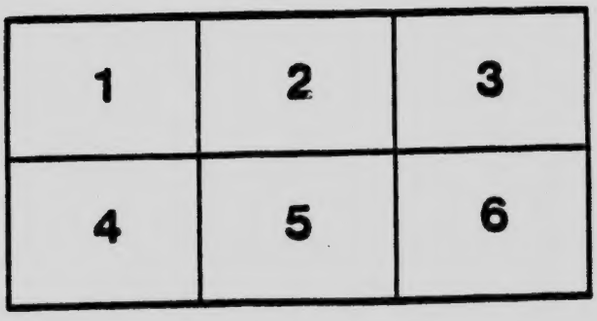

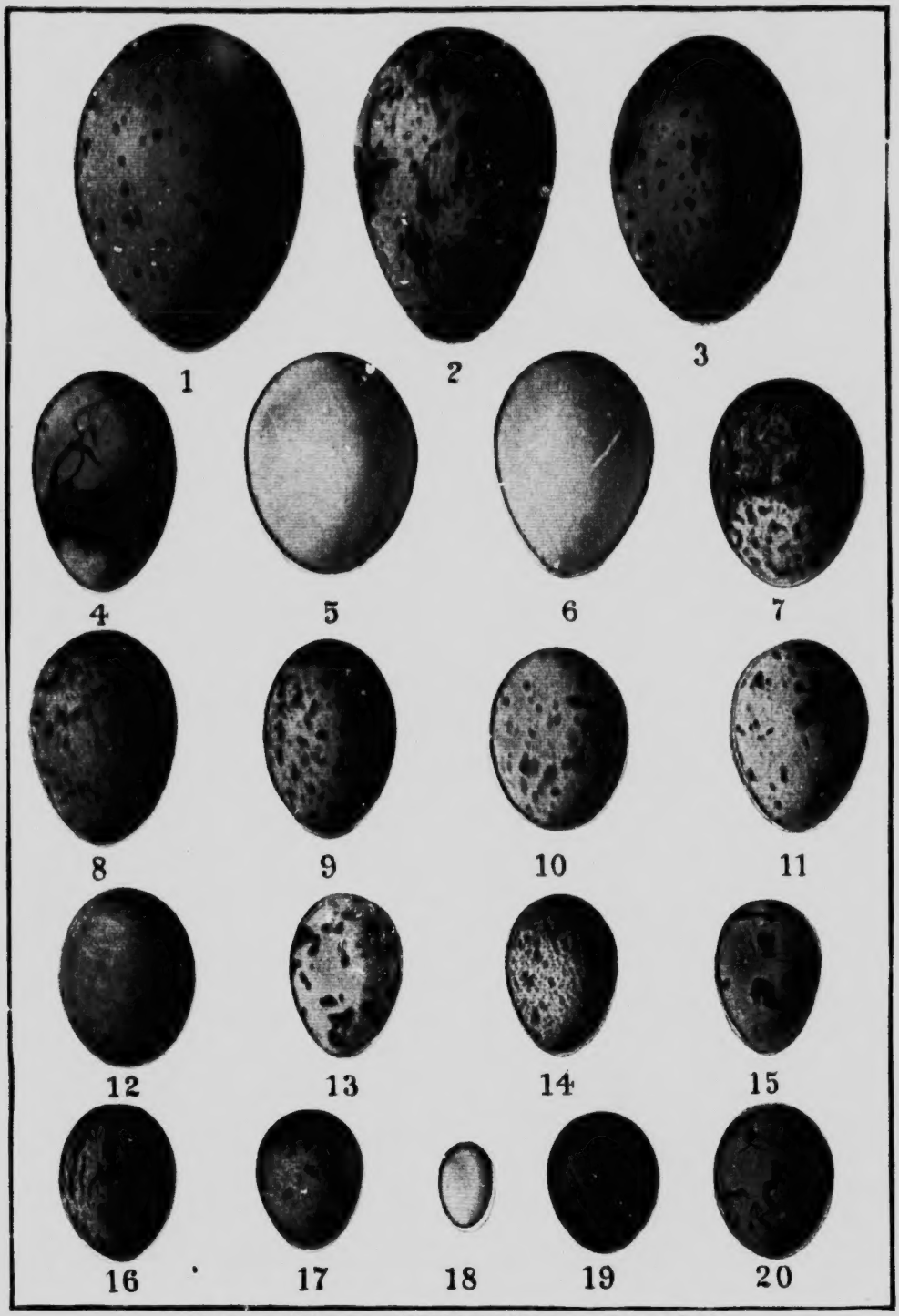

EGGS OF NORTH AMERICAN BIRDS (¾ Natural Size)

1. Northern raven. 2. American raven. 3. American crow. 4. Great-tailed grackle. 5. Belted kingfisher. 6. Pileated woodpecker. 7. Nighthawk. 8. American magpie. 9. Blue jay. 10. Whip-poor-will. 11. Meadowlark. 12. Black-billed cuckoo. 13. Kingbird. 14. Cowbird. 15. Baltimore oriole. 16. Crested flycatcher. 17. Skylark. 18. Ruby-throated hummingbird. 19. Bobolink. 20. Red-winged blackbird.

COMPLETE AUTHORITATIVE PRACTICAL

THE UNIVERSAL ENCYCLOPEDIA

A COMPREHENSIVE REFERENCE BOOK

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In Six Volumes

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KEY TO PRONUNCIATION

Three methods are used to indicate the pronunciation of the words forming the headings of the separate articles:

(1) By dividing the word into syllables, and indicating the syllable or syllables to be accented. This method is followed where the pronunciation is entirely obvious. Where accent marks are omitted, the omission indicates that all syllables are given substantially the same value.

(2) Where the pronunciation differs from the spelling, the word is re-spelled phonetically, in addition to the accentuation.

(3) Where the sound values of the vowels are not sufficiently indicated merely by an attempt at phonetic spelling, the following system of diacritical marks is additionally employed to approximate the proper sounds as closely as may be done:

ā, as in *fate*, or in *bare*.
ä, as in *alms*, Fr. *âme*, Ger. *Bahn*=â of Indian names.
å, the same sound short or medium, as in Fr. *bal*, Ger. *Mann*.
a, as in *fat*.
ą, as in *fall*.
ȧ, obscure, as in *rural*, similar to *u* in *but*, *e* in *her*: common in Indian names.
ē, as in *me*=*i* in *machine*.
e, as in *met*.
ė, as in *her*.
ī, as in *pine*, or as *ei* in Ger. *Mein*.
i, as in *pin*, also used for the short sound corresponding to ē, as in French and Italian words.
eu, a long sound as in Fr. *jeûne*, = Ger. long ö, as in *Söhne*, *Göthe* (Goethe).
eu, corresponding sound short or medium, as in Fr. *peu*=Ger. ö short.
ō, as in *note*, *moan*.
o, as in *not*, *frog*—that is, short or medium.
ŏ, as in *move*, *two*.
ū, as in *tube*.
u, as in *tub*: similar to ė and also to ȧ.
u̇, as in *bull*.
ü, as in Sc *abune*=Fr. *u* as in *du*, Ger. ü long as in *grün*, *Bühne*.
ů, the corresponding short or medium sound, as in Fr. *but*, Ger. *Müller*.
oi, as in *oil*.
ou, as in *pound*; or as *au* in Ger. *Haus*.

The consonants, b, d, f, h, j, k, l, m, n, ng, p, sh, t, v, and z, when printed in Roman type, are always given their common English values in the transliteration of foreign words. The letter c is indicated by s or k, as the case may be. For the remaining consonant sounds the following symbols are employed:

ch is always as in *rich*.
ḋ, nearly as *th* in *this* = Sp. *d* in *Madrid*, etc.
g is always hard, as in *go*.
ḫ represents the guttural in Scotch *loch*, Ger. *nach*, also other similar gutturals.
n̨, Fr. nasal *n* as in *bon*.
r represents both English *r*, and *r* in foreign words, in which it is generally much more strongly trilled.
s, always as in *so*.
th, as *th* in *thin*.
th, as *th* in *this*.
w always consonantal, as in *we*.
x = ks, which are used instead.
y always consonantal, as in *yea* (Fr. *ligne* would be re-written lēny).
zh, as *s* in *pleasure* = Fr. *j*.

VOLUME III

Encaustic Tiles, ornamental paving tiles of baked pottery, much used during the middle ages in the pavements of churches and other ecclesiastical edifices. The encaustic tile, strictly so called, was decorated with patterns formed by different colored clays inlaid in the tile and fired with it. The art appears to have originated in the latter part of the twelfth century, to have attained its highest perfection during the thirteenth, and to have sunk into disuse in the fifteenth. During the whole of this period it was principally carried on in England and Normandy. After a long lapse the art was revived in England in 1830 by Wright, a Shelton potter. In modern manufacture two methods are employed, the 'plastic' and the 'semi-dry' or 'dust' method. The first is, in all essentials, that used in the middle ages, except, perhaps, in the perfection of modern molding appliances; the second consists in ramming pulverized clay with a minimum of moisture into metal dies, the subsequent firing of tiles thus consolidated being attended with less risk from shrinkage.

Enceinte (àn-sant), in fortification, the continuous line of works which forms the main enclosure of a town or fortress. The term is also applied to the area within this line.

Encenia (en-sē'ni-a), festivals anciently commemorative of the founding of a city or the dedication of a church; and in later times periodical ceremonies, as at Oxford, in commemoration of founders and benefactors.

Encephala (en-sef'a-la), that division of the Mollusca characterized by possessing a distinct head, and comprising the Gasteropoda, Pteropoda and Cephalopoda.

Encephalitis (en-sef-a-lī'tis), inflammation of the brain.

Encephalon (en-sef'a-lon), a term for the brain and whole nervous mass included in the skull.

Enchanter's Nightshade (en-chant'-ers), a name common to plants of the genus *Circæa*, nat. order Onagraceæ; *C. lutetiana* is common in the United States from Carolina to Illinois, and *C. alpina* farther north. The former is about a foot and a half high, and has delicate ovate leaves; small, white flowers tinged with pink, and small, roundish seed-vessels covered with hooked bristles. It abounds in shady woods. *C. alpina* is similar, but smaller and more delicate. Both species are common in parts of Europe.

Enchasing (en-chās'ing), the art of producing raised or indented ornamental figures and designs upon metallic surfaces. See *Chasing*.

Enchorial Writing (en-kō'ri-al), the form of writing used by the old Egyptians for the common purposes of life, as distinct from the hieroglyphic and hieratic (used by the priests). Called also *Demotic*.

Encke (en'ke), JOHANN FRANZ, a German astronomer, born at Hamburg, in 1791. He studied under the astronomer Gauss at Göttingen. During the war of liberation (1813-15) he served as an artillerist in the German army, and after the peace became assistant in the observatory of Seeberg, near Gotha. Here he calculated the orbit of the comet observed by Mechain, Miss Herschel and Pons, predicted its return, and detected a gradual acceleration of movement, ascribed by him to the presence of a resisting medium. The comet is now known as Encke's comet. (See *Comets*.) The fame of his works, *Die Entfernung der Sonne* ('The Distance of the Sun') and *Der Venusdurchgang von 1769* ('Transit of Venus of 1769') led to his appointment as director of the Berlin Observatory (1825), a position which he held till his death in 1865.

Enclave (àn-klàv), a term used in German and French to denote a place or country which is entirely surrounded by the territories of another power. Thus, several petty duchies and principalities are enclaves of Prussia.

Encrinite (en'krin-īt), a name often applied to all the marine animals of the order Crinoidea or stone-lilies, class Echinodermata, but more specifically restricted to the genera having rounded, smooth stems attached to the

bottom, and supporting the body of the animal, which has numerous jointed arms radiating from a central disc, in which the mouth is situated. Encrinites were exceedingly numerous in past ages of the world's history; of those still existing our knowledge has been greatly increased of recent years through deep-sea dredging. Some of these forms are very graceful and interesting. See also *Crinoidea*.

Encyclical (en-sik'lik-al), a letter addressed by the pope to all his bishops, condemning certain errors, or giving advice regarding important public questions. It differs from a Bull in the fact that the latter is more special in its destination.

Encyclopedia (en-sī-klo-pē'di-a) CYCLOPÆDIA, or CYCLOPEDIA (Greek *en*, in, *kyklos*, a circle, and *paideia*, instruction), a systematic view of the whole extent of human knowledge or of particular departments of it with the subjects arranged generally in alphabetical order. Varro and Pliny the elder, among the Romans, attempted works of an encyclopedic nature, the latter in his well-known *Historia Naturalis* or *Natural History*. Other ancient encyclopedic works were those of Stobæus and Suidas, and especially of Marcianus Capella. In the thirteenth century a work on a regular plan was compiled by the Dominican, Vincent of Beauvais (d. 1264), in which was exhibited the whole sum of the knowledge of the middle ages. His work was entitled *Speculum Historiale, Naturale, Doctrinale*, to which an anonymous author added, some years later, a *Speculum Morale*. Roger Bacon's *Opus Majus* also belonged to the encyclopedic class. An exceedingly popular work was the *De Proprietatibus Rerum* of Bartholomeus de Glanvilla, an English Franciscan friar, which maintained its reputation from 1360 to the middle of the sixteenth century. In the seventeenth century various encyclopedic works were compiled, such as the Latin one of Johann Heinrich Alsted (in 7 vols., Herborn, 1620). In 1674 appeared the first edition of Moreri's *Le Grand Dictionnaire Historique;* in 1677 Johann Jacob Hoffmann published at Basel his *Lexicon Universale;* and in 1697 appeared Bayle's famous *Dictionnaire Historique et Critique*, which is still of great value. The first English alphabetical encyclopedia was the *Lexicon Technicum* published in 1704. Among the chief English works of this kind are: *Ephraim Chambers' Cyclopedia*, or a *Universal Dictionary of Arts and Sciences*, published in 1728; the *Encyclopedia Britannica*, published in Edinburgh, in eleven editions—the first 1768, the last in 1911; *Rees' Cyclopedia*, 1802-20; *Edinburgh Encyclopedia*, 1830; *The London Encyclopedia*, 1833; *The Penny Cyclopedia*, 1833-43, *Chambers' Encyclopedia*, 1860-68, second edition, 1888-92.

The larger American encyclopedias are the *Encyclopedia Americana*, 1829-3 the *New American Cyclopedia*, 1858 and 1881; Johnson's *Universal Cyclopedia*, 1874-77, and of more recent d the *New International Encyclopedia*, vols., and the *Encyclopedia Americana* 16 vols. Of the French encyclopedi the most famous is the great *Dictionna Encyclopédique*, by Diderot and D'Alembert (see next article); the *Encyclopé Méthodique, ou par Ordre des Matièr* 1781-1832; the *Encyclopédie Moder* 1824-32; the *Encyclopédie des Gens Monde*, 1835-44; the *Dictionnaire de Conversation et de la Lecture*, 1851-5 and the large and valuable *Grand D tionnaire Universel du XIX Siè* edited by Larousse. Numerous works this kind have been published in G many, the most popular being the *C versations-Lexikon* of Brockhaus; Meye *Konversations-Lexikon;* Pierer's *Kon sations-Lexikon*, and that issued Spamer. The most comprehensive is *Allgemeine Encyklopädie*, originally edi by Professors Ersch and Gruber. In dition to the works mentioned ma others have been issued of smaller si the articles, while little less numero being condensed, and adapted to the p poses of the busy reader. As a g example of these may be mentioned present work. In addition to the gene works mentioned, there are many of a cial character and several dictionar with encyclopedic information, such the English *Encyclopedic Dictionary* a the American *Century Dictionary* e *Encyclopedia*.

Encyclopédie (äṅ-sik-lo-pā-dē), T FRENCH, the m important literary work of the eighteen century after the works of Voltaire a Rousseau, originated in a French tra lation of *Ephraim Chambers' Cyclopedi* Diderot was appointed to edit it, a enlisted the ablest men of the tim contributors. D'Alembert (who wr the famous *Discours préliminaire*) edit the mathematics; Rousseau wrote t musical articles; Daubenton, those co nected with natural history; the Ab Yvon, those on logic, metaphysics a ethics; Toussaint, those on jurispru ence; Buffon contributed the artic Nature; and Montesquieu, Voltair

Euler, Marmontel, D'Holbach, Turgot, Grimm and Condorcet took some share in the great work. Diderot himself was a prolific contributor on a wide variety of topics. The prospectus appeared in November, 1750, and the first volume in 1751, the whole being completed, despite fierce opposition in 1765.

Endecagon (en-dek'a-gon), a plane figure of eleven sides and angles.

Endemic (en-dem'ik; Greek, *en*, and *dēmos*, people), a name commonly applied to diseases which attack the inhabitants of a particular district or country, and have their origin in some local cause, as the physical character of the place where they prevail, or in the employments, habits and mode of living of the people. Diseases which are endemic in one country may also appear in others, and become epidemic under influences resembling those which are the causes of the endemic in the former place.

Enderby Land (en'der-bi), an island in the Antarctic Ocean, long. 50° E., crossed by the Antarctic Circle.

Endive (en'div), a plant, *Cichorium Endivia*, nat. order Compositæ, a native of Asia, introduced into Britain in 1548, and cultivated for culinary purposes. It has large, sinuate, smooth, toothed, or finely curled, deep-green leaves, which, when blanched, are used in salads, soups, etc. Chicory or succory is *C. Intybus*.

Endless Screw (end'les), a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the angle of pitch of the screw. It is generally employed as a means of producing slow motion in the adjustments of machines, rather than as transmitter of any great amount of power.

Endlicher (end'li-hĕr), Stephen Ladislaus, an Austrian botanist, etc., born at Presburg in 1804. He was successively court-librarian at Vienna, and keeper of the natural history museum; and in 1840 was appointed professor of botany in the University of Vienna, and director of the botanic garden, which he immediately began to reorganize. He took part on the popular side in the German revolution of 1848, and died by his own hand in 1849. Among his chief botanical works are his *Genera Plantarum*, a systematic treatise on botany; and his *Enchiridion Botanicum* or *Manual of Botany*.

Endocarditis (en-dō-kar-dī'tis), inflammation of the endocardium or serous membrane covering the valves and internal surface of the heart.

Endogamy (en-dog'a-mi; Greek, *endon*, within; *gamos*, marriage), a custom among some savage peoples of marrying only within their own tribe; opposite to *exogamy*.

Endogenous Plants (en-doj'e-nus), or Endogens (Gr. *endon*, within; *gen*, to produce), one of the large primary classes into which the vegetable kingdom is divided, so named in consequence of the new

1. Section of the stem of a Palm: *c*, Portion of stem, natural size, showing the ends of the bundles of woody fiber; *e*, Remains of leaf-stalks; *f*, Bundles of woody fiber. 2, Endogenous Leaf showing its parallel veins. 3, Monocotyledonous Seed, showing its single cotyledon: *a a*, Cotyledon. 4, Germination of Palm: *c*, Cotyledon; *b*, Albumen; *d*, Plumule; *e*, Radicle issuing from a short sheath, endorhiza. 5, Flower of Endogen.

woody bundles being developed in the interior of the stem, in which there is no distinction of pith and bark. In transverse section these bundles appear scattered through the cellular matter, being more compact towards the circumference. The other organs of the plants are also characteristic. The leaves are generally parallel-veined, the flowers usually with three organs in each whorl, the seed has an embryo with one cotyledon, and the radicle issues from a sheath and is never developed into a tap-root in germination. To this class belong palms, grasses, rushes, lilies, etc. Endogens increase in thickness only to a limited extent; hence they are not injured by twining plants as exogens are.

Endomorph (en'du-morf), a term applied to minerals enclosed in crystals of other minerals.

Endoparasite (en-dō-par'a-sīt; Greek *endon*, within), a parasite living on the internal organs of ani-

mals, as opposed to an *ectoparasite*, which infests the skin.

Endorhiza (en-dō-rī'za), in botany, a term descriptive of the radicle of the embryo of monocotyledonous plants, which is developed inside a sheath (Gr. *endon*, within, *rhiza*, a root) from which it issues in germination. The cut shows the germinating embryo of the oat.

Endorhiza.

Endoskeleton (en-dō-skel'e-tun), in anatomy, a term applied to the internal bony structure of man and other animals (Greek, *endon* within), in contradistinction to *exoskeleton*, which is the outer and hardened covering of such animals as the crab, lobster, etc.

Endosmose, or ENDOSMOSIS (en'dos-mōs, en-dos-mō'sis), the transmission of fluids or gases through porous septa or partitions from the exterior to the interior of a vessel. An instrument for measuring the force of endosmotic action is known as an endosmometer.

Endosperm (en'do-sperm), the tissue surrounding the embryo in many seeds and which is contained with it within the testa. It contains the supply of food for the germinating embryo, and is also called albumen or perisperm.

Endymion (en-dim'i-on), a personage of Greek mythology, according to various accounts a huntsman, a shepherd, or a king of Elis, who is said to have asked of Zeus, or to have received as a punishment, eternal sleep. Others relate that Selēnē or Diana (the moon) conveyed him to Mount Latmos in Caria, and threw him into a perpetual sleep in order that she might enjoy his kisses whenever she pleased.

Enema (en'e-ma), any liquid or gaseous form of medicine for injection into the rectum. It is most commonly administered to induce peristaltic action of the bowels, but it is often the most desirable means of conveying into the system nourishment or stimulants.

Energy (en'er-ji), in physics, the power that a body or system possesses of doing work. A body may possess energy in one of two forms, viz., as *kinetic* energy, that is, the energy due to motion, and *potential* energy, that is, energy due to what may be called a position of advantage. Thus, a moving mass, a bullet for example, can do work in virtue of its motion, and the name kinetic energy is given to energy of this kind. Under this name is also included energy belonging to molecular motion, to electricity in motion, to heat and light, and to actual chemical action. Again, as examples of potential energy we may take the case of a mass raised up to a position in which it is capable of doing work by falling—the weight of a clock, for instance; but the term also includes the energy due to electrical separation, to absorbed heat, and to chemical separation, as in gunpowder, which is ready to do work by means of its explosion. From the investigations of Joule and others into the nature and phenomena of heat and the discovery of the equivalence of a definite quantity of mechanical energy to a definite quantity of heat, the grand principle of the *conservation of energy* was established. This asserts that the total amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable. If energy of any form seems to disappear in such a case it reappears in some other form. Thus, mechanical energy may be converted into heat. Heat again may be converted into the energy of electricity in motion, or into the potential energy of chemical separation. And electrical energy, whether potential or kinetic, and the energy of chemical separation, are also convertible into heat. (See also *Correlation of Physical Forces.*) Connected with this principle is another which states that no known natural process is *exactly* reversible, and that if we transform mechanical energy into heat, for example, we never can pass back and obtain from the heat produced precisely the amount of mechanical energy with which we commenced. Whatever attempt is made to transform and retransform energy by an imperfect process (and no known process is perfect), *part of the energy is necessarily transformed into heat*, and is *dissipated* so as to be incapable of further useful transformation. It, therefore, follows that as energy is in a constant state of transformation, there is a constant process of *degradation* of energy going on, a process by which energy constantly approaches the unavailable form of uniformly diffused heat and all the energy of the universe will take this final form, unless some process of reversal may arise.

Enfantin (àn-fàn-tan), BARTHÉLEMY PROSPER, one of the chief apostles of St. Simonianism; born at Paris in 1796. In 1825 he became acquainted with St. Simon, who in dying confided to him the task of continuing

the work. This he did with success until after the revolution of 1830, when, as the representative of the social and religious theories of the school, he quarreled with Bazard, the representative of its political ideas. Enfantin organized model communities, which quickly fell to pieces; the new organ of the sect, the *Globe*, was a failure; their convent at Ménilmontant, of which Enfantin was 'supreme father,' was broken up by government (1832). He himself was imprisoned as an offender against public morality (being an advocate of free love), and on his release attempted to found a model colony in Egypt, which was broken up in the second year. He then retired to Tain (Drôme), where he lived for some time as a farmer. In 1841 he was sent as member of a commission to explore the industrial resources of Algiers, and on his return published a work on the *Colonization of Algiers* (1848). On the revolution of 1848 he started a new journal, the *Crédit Public*, but after two years withdrew from public notice. He afterwards held an official positon on the Lyons and Mediterranean Railway until his death in 1864.

Enfield (en'fēld), a market town of England, county of Middlesex, 9 miles north by east of London. It is the seat of the government manufactory of rifles and small arms. Pop. (1911) 56,344.

Enfield, a township of Hartford Co., Connecticut, 18 miles N. of Hartford; divided into three districts—Thompsonville, Hazardville, and Enfield Street. Carpets, rugs, automobile parts, casket hardware, paper, paint, and cloth, etc., are manufactured. Pop. 11,000.

Engadine (en-ga-dēn'), a beautiful valley in Switzerland, in the Grisons, on the bank of the Inn, bordering on the Tyrol, about 50 miles long, but in some parts very narrow, divided into Upper and Lower. The pop. of the whole valley amounts to about 12,000. The language generally spoken is the Ladin, a branch of the Romanic tongue. The cold, dry climate and mineral springs have made the valley a favorite resort for invalids.

Engaged Column, in architecture, a column attached to a wall so that part of it (usually less than half) is concealed.

Engel (eng'l), KARL, a German writer on music; born in 1818; died in 1882, at London, where he had been settled for more than thirty years. He wrote *The Music of the Most Ancient Nations, An Introduction to the Study of National Music, Musical Myths and Facts*, etc.

Enghien (äṅ-gi-äṅ), or ENGUIEN, a town in Hainault, Belgium, between Brussels and Tournai. It has a superb castle, and gave the title of duke to a prince of the house of Bourbon Condé in memory of the victory gained here by the great Condé. Pop. 4541.

Enghien (äṅ-gi-äṅ), LOUIS ANTOINE HENRI DE BOURBON, DUKE OF, born at Chantilly in 1772; son of Louis Henry Joseph Condé, Duke of Bourbon. On the outbreak of the revolution he quitted France, traveled through various parts of Europe, and went in 1792, to Flanders to join his grandfather, the Prince of Condé, in the campaign against France. From 1796 to 1799 he commanded with distinguished merit the vanguard of Condé's army, which was disbanded at the Peace of Lunéville (1801). He then took up residence as a private citizen at Ettenheim in Baden, where he married the Princess Charlotte de Rohan Rochefort. He was generally looked upon as the leader of the *émigrés*, and was suspected by the Bonapartists of complicity in the attempt of Cadoudal to assassinate the first consul. An armed force was sent to seize him in Baden in violation of all territorial rights, and he was brought to Vincennes on the 20th of March, 1804. A mock trial was held the same night; and on the following morning he was shot in the ditch outside the walls. It was this event which drew from Fouché the comment since become proverbial: 'C'est plus qu'un crime, c'est une faute' ('It is worse than a crime, it is a blunder').

Engine (en'jin), a mechanical contrivance in which one or other of the natural forces is utilized for the performance of work of some kind; often distinctively a steam engine.

Engineer (en-ji-nēr'), a term of somewhat loose application, being applied both to mechanics employed in the construction or management of steam engines, and also to persons in general 'who make the useful application of mechanical science their peculiar study and profession,' the term *engineering* having a corresponding meaning. Those who turn their attention especially to the construction of docks, bridges, canals, lighthouses, railroads, sewage and drainage, etc., are generally classed as *civil engineers*; those who devote themselves to the manufacture of machinery are known as *mechanical engineers*; while *mining engineers* are those who discover minerals and manage mines, and *electrical engineers* those who are con-

cerned in electrical applications. A distinct department from any of these is that of the *military engineer*. The special duties of the military engineer consist in the construction of fortifications, including the trenches and batteries required in besieging places; also of barracks and magazines, and of roads and bridges to facilitate the passage of an army. Civil engineering as a profession may be said to have originated in England about 1770, when the improvements of the steam engine by Watt opened a new field for invention and adaptive skill. Since then it has pursued an active course of development.

Engineers, Corps of, organized in the United States in 1802. It is a special arm of the military service, charged with the selection and purchase of sites and the construction of fortifications; the removal of obstructions in streams; and important field duties in preparing for the movement of forces. It also plans and superintends harbor and river improvements, and makes surveys and geographical explorations. Until 1866 the engineer corps had the superintendence of the West Point academy; but since that year all branches of the service share in its supervision. A similar corps in the British army is known as the Royal Engineers.

Engineers in the Navy are commissioned officers having charge of the machinery of steam vessels. A thorough practical education in the construction and management of steam machinery is required. In military law they are considered non-combatants.

England, including Wales, the southern and larger portion of the island of Great Britain, is situated between 50° and 55° 46′ N. lat., and 1° 46′ E. and 5° 42′ W. lon. On the N. it is bounded by Scotland; on all other sides it is washed by the sea; on the E. by the North Sea or German Ocean; on the S. by the English Channel; and on the W. by St. George's Channel and the Irish Sea. Its figure is, roughly speaking, triangular, but with many windings and indentations, the coast-line measuring not less than 2765 miles. The length of the country, measured on a meridian from Berwick nearly to St. Alban's Head, is 365 miles. Its breadth, measured on a parallel of latitude, attains its maximum between St. David's Head, in South Wales, and the Naze, in Essex, where it amounts to 280 miles. The area is 58,311 square miles, of which 50,933 square miles are in England, and 7378 square miles in Wales. This is exclusive of the Channel Islands and the Isle of Man, which together would add 302 square miles more to the area. The subdivision of England into counties is said to date from the time when the country was still under several kings, but it does not appear to have assumed a definite form till the time of Alfred the Great. The existing division was first completed in the time of Henry VIII.

The capital of England and of the British Empire is London. The cities next in size (in order of population) are: Liverpool, Manchester, Birmingham, Sheffield, Leeds, Bristol, West Ham, Bradford, Kingston and Newcastle.

Physical Features.—The chief indentations are: on the east, the Humber, the Wash and the Thames estuary; on the west, the Solway Firth, Morecambe Bay, Cardigan Bay and the Bristol Channel; those on the south are less prominent, though including some useful harbors. The greater part of the coast consists of cliffs, in some places clayey, in others rocky, and sometimes jutting out into bold and precipitous headlands. The chief islands are: Holy Island, the Farne Islands, Sheppy and Thanet on the east coast; the Isle of Wight on the south; the Scilly Isles at the southwest extremity; and Lundy Island, Anglesey, Holyhead and Walney on the west.

The chief elevations of England and Wales are situated at no great distance from its western shores, and consist not so much of a continuous chain as of a succession of mountains and hills stretching, with some interruptions, from north to south, and throwing out numerous branches on both sides. The most important of its offsets are those of the west, more especially if we include in them the mountain masses in North western England sometimes classed separately as the Cumbrian range. Amid these mountains lie the celebrated English lakes, of which the most important are Windermere, Derwent Water, Coniston Lake and Ullswater. Here also is the highest summit of Northern England, Scawfell (3210 feet).

A large part of the surface of England consists of wide valleys and plains. Beginning in the north, the first valleys on the east side are those of the Coquet, Tyne and Tees; on the west the beautiful valley of the Eden, which, at first hemmed in between the Cumbrian range and Pennine chain, gradually widens out into a plain of about 470 square miles, with the town of Carlisle in its center. The most important of the northern plains is the Vale of York, which has an area of nearly 1000 square miles. Properly speaking, it is still the same

plain which stretches, with scarcely a single interruption, across the counties of Lincoln, Suffolk and Essex, to the mouth of the Thames, and to a considerable distance inland, comprising the Central Plain and the region of the Fens. On the west side of the island, in S. Lancashire and Cheshire, is the fertile Cheshire Plain. In Wales there are no extensive plains, the valleys generally having a narrow, rugged form favorable to romantic beauty, but not compatible with great fertility. Wales, however, by giving rise to the Severn, can justly claim part in the vale, or series of almost unrivaled vales, along which this stream pursues its romantic course through the counties of Montgomery, Salop, Worcester and Gloucester. Southeast of the Cotswold Hills is Salisbury Plain, but it is only in name that it can be classed with the other plains and level lands of England, being a large, elevated plateau, of an oval shape, with a thin, chalky soil only suitable for pasture. In the southwest the only vales deserving of notice are those of Taunton in Somerset and Exeter in Devon. A large portion of the southeast may be regarded as a continuous plain, consisting of what are called the Wealds of Sussex, Surrey and Kent, between the North and South Downs and containing an area of about 1000 square miles. The southeast angle of this district is occupied by the Romney Marsh, an extensive level tract composed, for the most part, of a rich marine deposit. Extensive tracts of a similar nature are situated on the east coast. Many of these lands are naturally the richest in the kingdom, but have been utilized only by means of drainage.

England is well supplied with rivers, some of them of great importance to industry and commerce. Most of them carry their waters to the North Sea. If we consider the drainage as a whole, four principal river basins may be distinguished, those of the Thames, Wash and Humber belonging to the German Ocean; and the Severn belonging to the Atlantic. The Thames, which is the chief of English rivers, has a length of 215 miles. Other rivers unconnected with these systems are the Tyne, Wear and Tees in the northeast; the Eden, Ribble, Mersey and Dee in the northwest. The south coast streams are very unimportant except for their estuaries.

In regard to the minerals, climate, agriculture, manufactures, etc., of England see the article *Britain*.

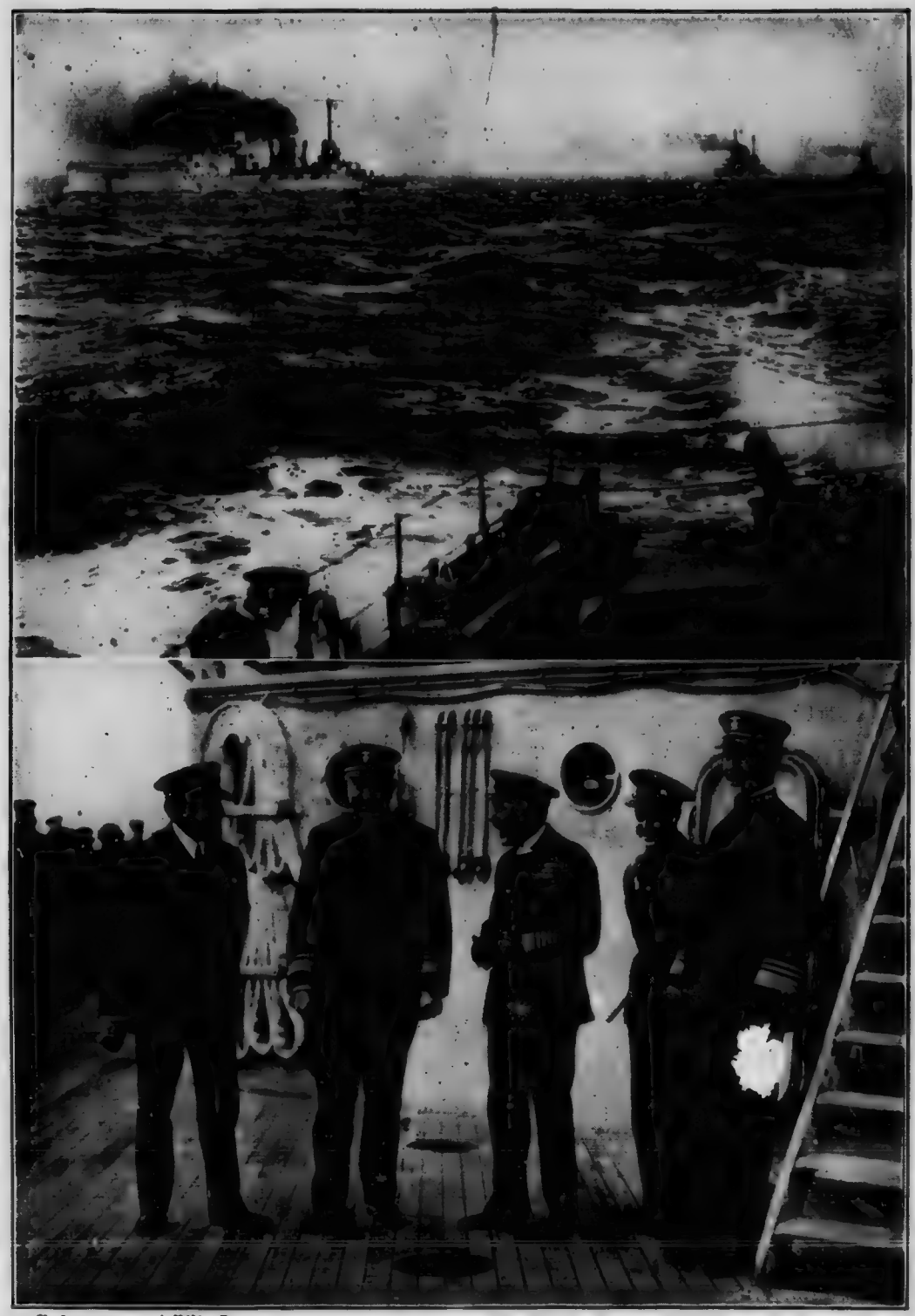
Civil History.—The history of England proper begins when it ceased to be a Roman possession. (See *Britain*.) On the withdrawal of the Roman forces, about the beginning of the fifth century A.D., the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious northern neighbors, the Scots and Picts. They applied for assistance to Aëtius, but the Roman general was too much occupied in the struggle with Attila to attend to their petition. In their distress they appear to have sought the aid of the Saxons; and according to the Anglo-Saxon narratives, three ships, containing 1600 men, were despatched to their help under the command of the brothers Hengest and Horsa. Vortigern, a duke or prince of the Britons, assigned them the isle of Thanet for habitation, and marching against the northern foe, they obtained a complete victory. The date assigned to these events by the later Anglo-Saxon chronicles is 449 A.D., the narratives asserting further that the Saxons, finding the land desirable, turned their arms against the Britons, and, reinforced by new bands, conquered first Kent and ultimately the larger part of the island. Whatever the credibility of the story of Vortigern, it is certain that in the middle of the fifth century the occasional Teutonic incursions gave place to persistent invasion with a view to settlement. These Teutonic invaders were Low German tribes from the country about the mouths of the Elbe and the Weser, the three most prominent being the Angles, the Saxons and the Jutes. Of these the Jutes were the first to form a settlement, taking possession of part of Kent, the Isle of Wight, etc.; but the larger conquests of the Saxons in the south and the Angles in the north gave to these tribes the leading place in the kingdom. The struggle continued for 150 years, and at the end of that period the whole southern part of Britain, with the exception of Strathclyde, Wales and West Wales (Cornwall), was in the hands of the Teutonic tribes. This conquered territory was divided among a number of small states or petty chieftaincies, seven of the most conspicuous of which are often spoken of as the *Heptarchy*. These were: 1. The kingdom of Kent; founded by Hengest in 455; ended in 823. 2. Kingdom of South Saxons, founded by Ella in 477; ended in 689. 3. Kingdom of East Angles, founded by Uffa in 571 or 575; ended in 792. 4. Kingdom of West Saxons; founded by Cerdic in 519; swallowed up the rest in 827. 5. Kingdom of Northumbria, founded by Ida in 547; absorbed by Wessex in 827.

6. Kingdom of East Saxons, founded by Erchew in 527; ended in 823. 7. Kingdom of Mercia, founded by Cridda about 584; absorbed by Wessex in 827. Each state was, in its turn, annexed to more powerful neighbors; and at length, in 827, Egbert, king of the West Saxon kingdom (Wessex), by his valor and superior capacity, united in his own person the sovereignty of what had formerly been seven kingdoms, and the whole came to be called England, that is Angle-land.

While this work of conquest and of intertribal strife had been in progress towards the establishment of a united kingdom, certain important changes had occurred. The conquest had been the slow expulsion of a Christian race by a purely heathen race, and the country had returned to something of its old isolation with regard to the rest of Europe. But before the close of the sixth century Christianity had secured a footing in the southeast of the island. Ethelbert, king of Kent and suzerain over the kingdoms south of the Humber, married a Christian wife, Bertha, daughter of Charibert of Soissons, and this event indirectly led to the coming of St. Augustine. The conversion of Kent, Essex and East Anglia was followed by that of Northumberland and then by that of Mercia, of Wessex, of Sussex, and lastly of Wight, the contest between the two religions being at its height in the seventh century. The legal and political changes immediately consequent upon the adoption of Christianity were not great, but there resulted a more intimate relation with Europe and the older civilizations, the introduction of new learning and culture, the formation of a written literature, and the fusion of the tribes and petty kingdoms into a closer and more lasting unity than that which could have been otherwise secured.

The kingdom, however, was still kept in a state of disturbance by the attacks of the Danes, who had made repeated incursions during the whole of the Saxon period, and about half a century after the unification of the kingdom became, for a brief time, masters of nearly the whole of England. But the genius of Alfred the Great, who had ascended the throne in 871, speedily reversed matters by the defeat of the Danes at Ethandune (878). Guthrum, their king, embraced Christianity, became the vassal of the Saxon king, and retired to a strip of land on the east coast, including Northumbria and called the Danelagh. The two immediate successors of Alfred, Edward (901-925) and Athelstan (925-940), the son and the grandson of Alfred, both vigorous and able rulers, had each in turn to direct his arms against these settlers of the Danelagh. The reigns of the next five kings, Edmund, Edred, Edwy, Edgar and Edward the Martyr are chiefly remarkable on account of the conspicuous place occupied in them by Dunstan, who was counselor to Edmund, minister of Edred, treasurer under Edwy, and supreme during the reigns of Edgar and his successor. It was possibly due to his policy that from the time of Athelstan till after the death of Edward the Martyr (978 or 979) the country had comparative rest from the Danes. During the tenth century many changes had taken place in the Teutonic constitutions. Feudalism was already taking root: the king's authority had increased; the folkland was being taken over as the king's personal property; the nobles by birth, or ealdormen, were becoming of less importance in administration than the nobility of thegns, the officers of the king's court. Ethelred (978-1016), who succeeded Edward, was a minor, the government was feebly conducted, and no united action being taken against the Danes their incursions became more frequent and destructive. Animosities between the English and the Danes who had settled among them became daily more violent, and a general massacre of the latter took place in 1002. The following year Sweyn invaded the kingdom with a powerful army and assumed the crown of England. Ethelred was compelled to take refuge in Normandy; and though he afterwards returned, he found in Canute an adversary no less formidable than Sweyn. Ethelred left his kingdom in 1016 to his son Edmund, who displayed great valor, but was compelled to divide his kingdom with Canute; and when he was assassinated in 1017 the Danes succeeded to the sovereignty of the whole.

Canute (Knut) who espoused the widow of Ethelred, that he might reconcile his new subjects, obtained the name of Great, not only on account of his personal qualities, but from the extent of his dominions, being master of Denmark and Norway as well as England. In 1035 he died, and in England was followed by other two Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the English line was again restored in the person of Edward the Confessor. Edward was a weak prince, and in the latter years of his reign had far less real power than his brother-in-law Harold, son of the great earl Godwin. On



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SURRENDER OF THE GERMAN HIGH SEAS FLEET

Actual photograph showing the greatest naval surrender in history—the German fleet arriving to surrender. *Below*, The commanders of the British and American fleets, Admirals Beatty, Sims and Rodman, the King of England and the Prince of Wales viewing the surrender.

Edward's death in 1066 Harold accordingly obtained the crown. He found, however, a formidable opponent in the second cousin of Edward, William of Normandy, who instigated the Danes to invade the northern counties, while he, with 60,000 men, landed in the south. Harold vanquished the Danes, and hastening southward met the Normans near Hastings, at Senlac, afterwards called Battle. Harold and his two brothers fell (October 14, 1066), and William (1066-87) immediately claimed the government as lawful king of England, being subsequently known as William I, the Conqueror. For some time he conducted the government with great moderation; but being obliged to reward those who had assisted him he bestowed the chief offices of government upon Normans, and divided among them a great part of the country. The revolts of the native English which followed were quickly crushed, continental feudalism in a modified form was established, and the English Church reorganized under Lanfranc as Archbishop of Canterbury.

At his death, in 1087, William II, commonly known by the name of Rufus, the conqueror's second son, obtained the crown, Robert, the eldest son, receiving the duchy of Normandy. In 1100, when William II was accidentally killed in the New Forest, Robert was again kept from the throne by his younger brother Henry (Henry I), who in 1106 even wrested from him the duchy of Normandy. Henry's power being secured, he entered into a dispute with Anselm the primate, and with the pope concerning the right of granting investure to the clergy. He supported his quarrel with firmness, and brought it to a favorable issue. His reign was also marked by the suppression of the greater Norman nobles in England, whose power (like that of many continental feudatories) threatened to overshadow that of the king, and by the substitution of a class of lesser nobles. In 1135 he died in Normandy, leaving behind him only a daughter, Matilda.

By the will of Henry I his daughter Maud or Matilda, wife of Geoffrey Plantagenet, Count of Anjou, and frequently styled the Empress Matilda, because she had first been married to Henry V, emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed an amicable arrangement was brought about, by which it was agreed that Stephen should continue to reign during the remainder of his life, but that he should be succeeded by Henry, son of Matilda and the Count of Anjou. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II, being the first of the Plantagenet or Angevin kings. A larger dominion was united under his sway than had been held by any previous sovereign of England, for at the time when he became king of England he was already in the possession of Anjou, Normandy and Aquitaine.

Henry II found far less difficulty in restraining the license of his barons than in abridging the exorbitant privileges of the clergy, who claimed exemption not only from the taxes of the state, but also from its penal enactments, and who were supported in their demands by the primate Becket. The king's wishes were formulated in the Constitutions of Clarendon (1164), which were at first accepted and then repudiated by the primate. The assassination of Becket, however, placed the king at a disadvantage in the struggle, and after his conquest of Ireland (1171) he submitted to the church, and did penance at Becket's tomb. Henry was the first who placed the common people of England in a situation which led to their having a share in the government. The system of frank-pledge was revived, trial by jury was instituted by the Assize of Clarendon, and the Eyre courts were made permanent by the Assize of Nottingham. To curb the power of the nobles he granted charters to town, freeing them from all subjection to any but himself, thus laying the foundation of a new order in society.

Richard I, called Cœur de Lion, who in 1189 succeeded to his father, Henry II, spent most of his reign away from England. Having gone to Palestine to join in the third crusade, he proved an intrepid soldier. Returning homeward in disguise through Germany, he was made prisoner by Leopold, duke of Austria, but was ransomed by his subjects. In the meantime John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude Richard from his right. Richard's presence for a time restored matters to some appearance of order; but having undertaken an expedition against France, he received a mortal wound at the siege of Chalons, in 1199.

John was at once recognized as King of England, and secured possession of Normandy; but Anjou, Maine and Tou-

raine acknowledged the claim of Arthur, son of Geoffrey, second son of Henry II. On the death of Arthur, while in John's power, these four French provinces were at once lost to England. John's opposition to the pope in electing a successor to the see of Canterbury in 1205 led to the kingdom being placed under an interdict; and the nation being in a disturbed condition, he was at last compelled to receive Stephen Langton as archbishop, and to accept his kingdom as a fief of the papacy (1213). His exactions and misgovernment had equally embroiled him with the nobles. In 1213 they refused to follow him to France, and on his return defeated, they at once took measures to secure their own privileges and abridge the prerogatives of the crown. King and barons met at Runnymede, and on June 15, 1215, the Great Charter (Magna Charta) was signed. It was speedily declared null and void by the pope, and war broke out between John and the barons, who were aided by the French king. In 1216, however, John died, and his turbulent reign was succeeded by the almost equally turbulent reign of Henry III.

During the first years of the reign of Henry III, the abilities of the Earl of Pembroke, who was regent until 1219, retained the kingdom in tranquillity; but when, in 1227, Henry assumed the reins of government he showed himself incapable of managing them. The charter was three times reissued in a modified form, and new privileges were added to it, but the king took no pains to observe its provisions. The struggle, long maintained in the great council (henceforward called Parliament) over money grants and other grievances reached an acute stage in 1263, when civil war broke out. Simon de Montfort, who had laid the foundations of the House of Commons by summoning representatives of the shire communities to the Mad Parliament of 1258, had by this time engrossed the sole power. He defeated the king and his son Edward at Lewes in 1264, and in his famous parliament of 1265 still further widened the privileges of the people by summoning to it burgesses as well as knights of the shire. The escape of Prince Edward, however, was followed by the battle of Evesham (1265), at which Earl Simon was defeated and slain, and the rest of the reign was undisturbed.

On the death of Henry III, in 1272, Edward I succeeded without opposition. From 1276 to 1284 he was largely occupied in the conquest and annexation of Wales, which had become practically independent during the barons' wars. I 1292 Balliol, whom Edward had decid to be rightful heir to the Scottish thron did homage for the fief to the Englis king; but when, in 1294, war broke ou with France, Scotland also declared wa The Scots were defeated at Dunba (1296), and the country placed und an English regent; but the revolt und Wallace (1297) was followed by th of Bruce (1306), and the Scots remaine unsubdued. The reign of Edward wa distinguished by many legal and legisl tive reforms, such as the separation o the old king's court into the Court o Exchequer, Court of King's Bench, an Court of Common Pleas, the passage o the Statute of Mortmain, etc. In 129 the first perfect parliament was sum moned, the clergy and barons by speci writ, the commons by writ to th sheriffs directing the election of tw knights from each shire, two citizen from each city, two burghers from eac borough. Two years later the impos tion of taxation without consent o parliament was forbidden by a specia act (De Tallagio non Concedendo). Th great aim of Edward, however, to in clude England, Scotland and Wales i one kingdom proved a failure, and h died in 1307 marching against Robe Bruce.

The reign of his son Edward II wa unfortunate to himself and to his king dom. He made a feeble attempt to carr out his father's last and earnest reques to prosecute the war with Scotland, bu the English were almost constantly un fortunate; and at length, at Bannoch burn (1314), they received a defeat fro Robert Bruce which ensured the inde pendence of Scotland. The king soo proved incapable of regulating the law less conduct of his barons; and his wife a woman of bold, intriguing disposition joined in the confederacy against him which resulted in his imprisonment an death in 1327.

The reign of Edward III was as bril liant as that of his father had been th reverse. The main projects of the third Edward were directed against Fr the crown of which he claimed in 132 in virtue of his mother, the daughter o King Philip. The victory won by the Black Prince at Crécy (1346), the cap ture of Calais (1347), and the victory of Poitiers (1356) ultimately led to the Peace of Brétigny, in 1360, by which Edward III received all the west of France on condition of renouncing his claim to the French throne. (See *Brétigny*.) Before the close of his reign however, these advantages were all lost

again, save a few principal towns on the coast.

Edward III was succeeded in 1377 by his grandson Richard II, son of Edward the Black Prince. The people of England now began to show, though in a turbulent manner, that they had acquired just notions of government. In 1380 an unjust and oppressive poll tax brought their grievances to a head, and 100,000 men, under Wat Tyler, marched towards London (1381). Wat Tyler was killed while conferring with the king, and the prudence and courage of Richard appeased the insurgents. Despite his conduct on this occasion, Richard was deficient in the vigor necessary to curb the lawlessness of the nobles. In 1398 he banished his cousin, Henry Bolingbroke; and on the death of the latter's father, the duke of Lancaster, unjustly appropriated his cousin's patrimony. To avenge the injustice Bolingbroke landed in England during the king's absence in Ireland, and at the head of 60,000 malcontents compelled Richard to surrender. He was confined in the Tower, and despite the superior claims of Edmund Mortimer, Earl of March, Henry was appointed king (1399), the first of the House of Lancaster. Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV, acquired the crown rendered his reign extremely turbulent, but the vigor of his administration quelled every insurrection. The most important—that of the Percies of Northumberland, Owen Glendower and Douglas of Scotland—was crushed by the battle of Shrewsbury (1403). During the reign of Henry IV the clergy of England first began the practice of burning heretics under the act *de hæretico comburendo*, passed in the second year of his reign. The act was chiefly directed against the Lollards, as the followers of Wickliffe now came to be called. Henry died in 1413, leaving his crown to his son, Henry V, who revived the claim of Edward III to the throne of France in 1415 and invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; the victory of Agincourt was gained in 1415; and after a second campaign a peace was concluded at Troyes in 1420, by which Henry received the hand of Katherine, daughter of Charles VI, was appointed regent of France during the reign of his father-in-law, and declared heir to the throne on his death. The two kings, however, died within a few weeks of each other in 1422, and the infant son of Henry thus became King of England (as Henry VI) and France at the age of nine months.

England during the reign of Henry VI was subjected, in the first place, to all the confusion incident to a long minority, and afterwards to all the misery of a civil war. Henry allowed himself to be managed by any one who had the courage to assume the conduct of his affairs, and the influence of his wife, Margaret of Anjou, a woman of uncommon capacity, was of no advantage either to himself or the realm. In France (1422-53) the English forces lost ground, and were finally expelled by the celebrated Joan of Arc, Calais alone being retained. The rebellion of Jack Cade in 1450 was suppressed, only to be succeeded by more serious trouble. In that year Richard, Duke of York, the father of Edward, afterwards Edward IV, began to advance his pretensions to the throne, which had been so long held by the house of Lancaster. His claim was founded on his descent from the third son of Edward III, Lionel, duke of Clarence, who was his great-great-grandfather on the mother's side, while Henry was the great-grandson on the father's side of John of Gaunt, duke of Lancaster, the fourth son of Edward III. Richard of York was also grandson on the father's side of Edmund, fifth son of Edward III. The wars which resulted, called the Wars of the Roses, from the fact that a red rose was the badge of the house of Lancaster and a white one that of the house of York, lasted for thirty years, from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, August 22, 1485. Henry VI was twice driven from the throne (in 1461 and 1471) by Edward of York, whose father had previously been killed in battle in 1460. Edward of York reigned as Edward IV from 1461 till his death in 1483, with a brief interval in 1471; and was succeeded by two other sovereigns of the house of York, first his son, Edward V, who reigned for eleven weeks in 1483; and then by his brother, Richard III, who reigned from 1483 till 1485, when he was defeated and slain on Bosworth field by Henry Tudor, of the house of Lancaster, who then became Henry VII.

Henry VII was at this time the representative of the house of Lancaster, and in order at once to strengthen his own title, and to put an end to the rivalry between the houses of York and Lancaster, he married in 1486 Elizabeth, the sister of Edward V and heiress of the house of York. His reign was disturbed by insurrections attending the impostures of Lambert Simnel (1487), who

pretended to be a son of the Duke of Clarence, brother of Edward IV, and of Perkin Warbeck (1488), who affirmed that he was the duke of York, younger brother of Edward V; but neither of these attained any magnitude. The king's worst fault was the avarice which led him to employ in schemes of extortion such instruments as Empson and Dudley. His administration throughout did much to increase the royal power and to establish order and prosperity. He died in 1509.

The authority of the English crown, which had been so much extended by Henry VII, was by his son, Henry VIII, exerted in a tyrannical and capricious manner. The most important event of the reign was undoubtedly the Reformation; though it had its origin rather in Henry's caprice and in the casual situation of his private affairs than in his conviction of the necessity of a reformation in religion, or in the solidity of reasoning employed by the reformers. Henry had been espoused to Catharine of Spain, who was first married to his elder brother Arthur, a prince who died young. Henry became dissatisfied with his queen, and enamored of one of her maids of honor, Anne Boleyn. He had recourse, therefore, to the pope to dissolve a marriage which had at first been rendered legal only by a dispensation from the pontiff; but failing in his desires he broke away entirely from the Holy See, and in 1534 got himself recognized by act of parliament as the head of the English Church. He died in 1547. He was married six times, and left three children, each of whom reigned in turn. These were: Mary, by his first wife, Catharine of Aragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour.

Edward, who reigned first, with the title of Edward VI, was nine years of age at the time of his succession, and died in 1553, when he was only sixteen. His short reign, or rather the reign of the Earl of Hertford, afterwards Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers, who acquired great part of the power formerly engrossed by the Catholics. The intrigues of Dudley, duke of Northumberland, during the reign of Edward, caused Lady Jane Grey to be declared his successor; but her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII, was placed upon the throne, and Lady Jane Grey and her husband were both executed. Mary, a bigoted Catholic, seems to have wished for the crown only for the purpose of reëstablishing the Roman Catholic faith. Political motives had induced Philip of Spain to accept of her as a spouse; but she could never prevail on her subjects to allow him any share of power. She died in 1558.

Elizabeth, who succeeded her sister Mary, was attached to the Protestant faith, and found little difficulty in establishing it in England. Having concluded peace with France (1559), Elizabeth set herself to promote the confusion which prevailed in Scotland, to which her cousin Mary had returned from France as queen in 1561. In this she was so far successful that Mary placed herself in her power (1568), and after many years' imprisonment was sent to the scaffold (1587). As the most powerful Protestant nation, and as a rival to Spain in the New World, it was natural that England should become involved in difficulties with that country. The dispersion of the Armada by the English fleet under Howard, Drake and Hawkins was the most brilliant event of a struggle which abounded in minor feats of valor. In Elizabeth's reign London became the center of the world's trade, the extension of British commercial enterprise being coincident with the ruin of Antwerp in 1585. The parliament was increased by the creation of sixty-two new boroughs, and its members were exempted from arrest. In literature not less than in politics and in commerce the same full life displayed itself, and England began definitely to assume the characteristics which distinguish her from the other European nations of to-day.

To Elizabeth succeeded (in 1603) James VI of Scotland and I of England, son of Mary, Queen of Scots, and Darnley. His accession to the crown of England in addition to that of Scotland did much to unite the two nations, though a certain smoldering animosity still lingered. His dissimulation, however, ended in his satisfying neither of the contending ecclesiastical parties — the Puritans or the Catholics; and his absurd insistence on his divine right made his reign a continuous struggle between the prerogative of the crown and the freedom of the people. His extravagance kept him in constant disputes with the parliament, which would not grant him the sums he demanded, and compelled him to resort to monopolies, loans, benevolences, and other illegal methods. The nation at large, however, continued to prosper through the whole of this inglorious reign. His son, Charles

I, who succeeded him in 1625, inherited the same exalted ideas of royal prerogative, and his marriage with a Catholic, his arbitrary rule and illegal methods of raising money provoked bitter hostility. Under the guidance of Laud and Strafford things went from bad to worse. Civil war broke out in 1642 between the king's party and that of the parliament, and the latter proving victorious, in 1649 the king was beheaded.

A commonwealth or republican government was now established, its most prominent figure being Oliver Cromwell, the ablest leader of the parliamentary forces. Mutinies in the army among Fifth-monarchists and Levellers were subdued by Cromwell and Fairfax, and Cromwell in a series of masterly movements subjugated Ireland and gained the important battles of Dunbar and Worcester. At sea Blake had destroyed the Royalist fleet under Rupert, and was engaged in an honorable struggle with the Dutch under Van Tromp. But within the governing body matters had come to a deadlock. A dissolution was necessary, yet parliament shrank from dissolving itself, and in the meantime the reform of the law, a settlement with regard to the church, and other important matters remained untouched. In April, 1653, Cromwell cut the knot by forcibly ejecting the members and putting the keys of the house in his pocket. From this time he was practically head of the government, which was vested in a council of thirteen. A parliament—the Little or Barebone's Parliament—was summoned, and in December of the same year Cromwell was installed Lord Protector of the Commonwealth of England, Scotland and Ireland. With more than the power of a king, he succeeded in dominating the confusion at home and made the country feared throughout the whole of Europe. Cromwell died in 1658, and the brief and feeble protectorate of his son Richard followed.

There was now a widespread feeling that the country would be better under the old form of government, and Charles II, son of Charles I, was called to the throne by the restoration of 1660. He took complete advantage of the popular reaction from the narrowness and intolerance of Puritanism and in his later years endeavored to carry it to the extreme of establishing the Catholic religion. The promises of religious freedom made by him before the restoration in the Declaration of Breda were broken by the Test and Corporation acts, and by the Act of Uniformity, which drove two thousand clergymen from the church and created the great dissenting movement of modern times. The Conventicle and Five-mile Acts followed, and the 'Drunken Parliament' restored Episcopacy in Scotland. At one time even civil war seemed again imminent. The abolition of the censorship of the press (1679) and the reaffirmation of the Habeas Corpus principle are the most praiseworthy incidents of the reign.

As Charles II left no legitimate issue, his brother, the duke of York, succeeded him as James II (1685-88). An invasion by an illegitimate son of Charles, the duke of Monmouth, who claimed the throne, was suppressed, and the king's arbitrary rule was supported by the wholesale butcheries of such instruments as Kirke and Jeffreys. The king's zealous countenance of Roman Catholicism and his attempts to force the church and the universities to submission provoked a storm of opposition. Seven prelates were brought to trial for seditious libel, but were acquitted amid general rejoicing. The whole nation was prepared to welcome any deliverance, and in 1688 William of Orange, husband of James' daughter Mary, landed in Torbay. James fled to France, and a convention summoned by William settled the crown upon him, he thus becoming William III. Annexed to this settlement was a Declaration of Rights circumscribing the royal prerogative by depriving the king of the right to exercise dispensing power, or to exact money, or maintain an army without the assent of parliament. This placed henceforward the right of the British sovereign to the throne upon a purely statutory basis. A toleration act, passed in 1689, released dissent from many penalties. An armed opposition to William lasted for a short time in Scotland, but ceased with the fall of Viscount Dundee, the leader of James' adherents; and though the struggle was prolonged in Ireland, it was brought to a close before the end of 1691. The following year saw the origination of the national debt, the exchequer having been drained by the heavy military expenditure. A bill for triennial parliaments was passed in 1694, the year in which Queen Mary died. For a moment after her death William's popularity was in danger, but his successes at Namur and elsewhere, and the obvious exhaustion of France, once more confirmed his power. The treaty of Ryswick followed in 1697, and the death of James II in exile, in 1701, removed an important source of danger. Early in the following year William also died,

and by the act of settlement Anne succeeded him.

The closing act of William's reign had been the formation of the grand alliance between England, Holland and the German Empire, and the new queen's rule opened with the brilliant successes of Marlborough at Blenheim (1704) and Ramillies (1706). Throughout the earlier part of her reign the Marlboroughs practically ruled the kingdom, the duke's wife, Sarah Jennings, being the queen's most intimate friend and adviser. In 1707 the history of England becomes the history of Britain, the Act of Union passed in that year binding the parliaments and realms of England and Scotland into a single and more powerful whole. For the later history of England see article *Britain*.

Ecclesiastical History.—The first religion of the Celts of England was Druidism. It has been conjectured that Christianity may have reached Britain by way of France (Gaul) before the conclusion of the first, or not long after the commencement of the second century, but the period and manner of its introduction are uncertain. It had, however, made considerable progress in the island previous to the time of Constantine the Great (306-337).

A period of almost total eclipse followed the inroad of the pagan Saxons, and it was not till A.D. 570 that signs of change showed themselves in the new nationality. On the coming of Austin, or St. Augustine, sent over in 596 by Gregory the Great, a residence at Canterbury was assigned to him, and Ethelbert, king of Kent, and most of his subjects, adopted Christianity. Other missionaries followed; East Saxons were soon after converted by Mellitus; and a bishop's see was established at London, their capital, early in the seventh century. The Northumbrians were next converted, and the conversion of the other kingdoms followed in the course of the seventh century.

To promote the union of the churches thus founded in England with the Church of Rome, a grand council was summoned by Theodore of Tarsus, archbishop of Canterbury, at Hertford, in A.D. 673, when uniformity was secured among all the English churches, and the see of Canterbury made supreme.

The clergy in course of time attained, particularly after the Norman conquest, to such a height of domination as to form an *imperium in imperio*. Under Anselm (1093-1109) the church was practically emancipated from the control of the state, and the power of the pope became supreme. The result was a considerable increase of monasticism in England, and the prevalence of the greatest abuses under the cloak of church privilege. Several monarchs showed themselves restive under the papal control, but without shaking off the yoke; and though Henry II succeeded in abating some evils, yet the severity of the penance exacted from him for the murder of Becket is a striking proof of the power that the church then had in punishing offenses committed against itself. The reaction set in during the reign of Henry III, when the vigorous independence of Robert Grosseteste did much to stimulate the individual life of the English church. With the reign of Edward I the new system of parliaments came as an effective rival of the church synods, and various acts restrained the power of the clergy. In the fourteenth century the teaching of Wickliffe promised to produce a thorough revolt from Rome; but the difficulties of the house of Lancaster, which drove its members to propitiate the church, and the Wars of the Roses, prevented matters coming to a head.

A steady decay of vital power set in, however, and when Henry VIII resolved to recast the English church there was no effective protest. In 1531 the convocation of the clergy addressed a petition to Henry VIII, as the chief protector and only and supreme lord of the English Church. Not very long after the parliament abolished appeals to the see of Rome, dispensations, licenses, bull of institution for bishoprics and archbishoprics, the payment of Peter's-pence, and the annates. In 1534 the papal authority was set aside by act of parliament, and by another act of parliament, passed in 1535, Henry assumed the title of protector of the Church of England. These acts, although they severed the connection between the English Church and the holy see, did not alter the religious faith of the church. But under Edward VI, the Duke of Somerset, the protector of the realm during the minority of the king, caused a more thorough reform of the doctrines and ceremonies of the church to be made. At his instigation parliament in 1547 repealed the statute of the six articles promulgated by Henry VIII, and in 1551 a new confession of faith was embodied in forty-two articles, denying the infallibility of councils, keeping only two sacraments, baptism and the Lord's supper, and rejecting the real presence, the invocation of saints, prayer for the dead, purgatory, and the celibacy of the clergy. At the same time a new liturgy

was composed, in which English was substituted for Latin.

With the reign of Mary the old religion was reëstablished: and it was not till that of Elizabeth that the Church of England was finally instituted in its present form. The doctrines of the church were again modified, and the forty-two articles were reduced to thirty-nine by the convocation of the clergy in 1563. In 1559, before the close of the first year of Elizabeth's reign, the Acts of Supremacy and Uniformity were passed with the object of bringing about the entire subjection of the church and the people in religious matters to the royal authority.

From James I some relief was anticipated by Puritans and nonconformists, but they were disappointed. Under Charles I the attempt was made, through the instrumentality of Laud, to reduce all the churches of Great Britain under the jurisdiction of bishops. But after the death of Laud the parliament abolished the episcopal government, and condemned everything contrary to the doctrine, worship and discipline of the Church of Geneva. As soon as Charles II was restored the ancient forms of ecclesiastical government and public worship were reëstablished and three severe measures were passed against nonconformity, namely, the Corporation Act of 1661, the Act of Uniformity, passed in 1662, and the Test Act, passed in 1673. In the reign of William III, and particularly in 1689, the divisions among the friends of episcopacy gave rise to the two parties called the *high-churchmen* or *non-jurors* and *low-churchmen*. The former maintained the doctrine of passive obedience to the sovereign; that the hereditary succession to the throne is of divine institution; that the church is subject to the jurisdiction of God alone, etc. The gradual progress of civil and religious liberty since that time has settled practically many such controversies. The great increase of the Dissenters in recent times (they are not much less numerous than the members of the Established Church) has led to new concessions in their favor, and especially to the repeal of the Corporation and Test acts (in 1828), the Catholic emancipation (in 1829), and the opening of the universities in England to Dissenters (1871). As at present constituted, the established religion of England is Episcopacy. The sovereign is the supreme head. The church is governed by two archbishops and thirty-one bishops. The Archbishop of Canterbury is styled the *primate of all England*, and to him belongs the privilege of crowning the kings and queens of England. The Archbishop of York is styled *primate of England*. The doctrine of the Church of England are contained in the Thirty-nine Articles; the form of worship is contained in the Book of Common Prayer.

Englewood, a city of Bergen County, New Jersey, 14 miles N. of New York.

English Architecture, Early. See *Early English Architecture.*

English Art. As regards *architecture*, little can be said in respect to the style prevalent in England between the invasion of the Anglo-Saxons and the Norman Conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. The Norman style was introduced in the reign of Edward the Confessor, though the workmen, both then and after the Conquest, being English, the earlier work preserved many native characteristics. The Norman period proper extends from about 1000 to 1150, some of the best examples being parts of the cathedrals of Rochester, Winchester, Durham and Canterbury. In the brief period 1100 to 1195 a marked change took place in the adoption of the pointed arch and what is known as *the Early English style.* Improved methods of construction led to the use of lighter walls and pillars instead of the heavy masses employed in the Norman style. Narrow, lancet-shaped windows took the place of the round arch; bold projecting buttresses were introduced; and the roofs and spires became more lofty and more pointed, while in the interiors pointed arches rested on lofty, clustered pillars. The best Early English type is Salisbury Cathedral. The Early English style has been regarded as lasting from 1190 to 1270, when the *Decorated style* of Gothic began to prevail. The transition to the Decorated style was gradual, but it may be considered as lasting to 1377. Exeter Cathedral is an excellent example of the earliest Decorated style. Between 1360 and 1399 the Decorated style gave place to *the Perpendicular*, which prevailed from 1377 to 1547, and was an exclusively English style. Gothic architecture, though it lingered on in many districts, practically came to an end in England in the reign of Henry VIII. The *Elizabethan and Jacobean styles* which followed were transitions from the Gothic to the Italian, with which these styles were more or less freely mixed. Many palatial mansions were built in

these styles. In the reign of Charles I Inigo Jones designed, among other buildings, Whitehall Palace and Greenwich Hospital in a purely classic style. After the great fire in London (1666) Sir Christopher Wren designed an immense number of churches and other buildings in classic style, particularly St. Paul's Cathedral, the Sheldonian Theater of Oxford, Chelsea Hospital, etc. Various phases of classic or Renaissance continued to prevail during the eighteenth and earlier part of the nineteenth century. About 1836 the Gothic revival commenced, and that style has been employed with considerable success in the churches erected in recent times. The Houses of Parliament, erected in 1840-60 in the Tudor style, the Law Courts of Salford, St. Pancras railway station, and the Law Courts of London (opened 1882) in the Gothic, served to sustain an impetus that had been given to the use of that style. At the present day Gothic is much employed for ecclesiastical and collegiate buildings, and a mild type of Renaissance for civil buildings. Of late years a style that has received the name of 'Queen Anne' is much in vogue for private residences. It is very mixed, but withal highly picturesque.

Very little is known of the state of the art of *painting* among the Anglo-Saxons; but in the ninth century Alfred the Great caused numerous MSS. to be adorned with miniatures, and about the end of the tenth century Archbishop Dunstan won reputation as a miniature painter. Under William the Conquerer and his two sons the painting of large pictures began to be studied, and Lanfranc, archbishop of Canterbury, adorned the vault of his church with paintings. Numerous miniatures of the thirteenth and fourteenth centuries have come down to us, rude in execution, but not without originality. From this period down to the eighteenth century a succession of foreign painters resided in England, of whom the chief were Mabuse, Hans Holbein, Federigo Zucchero, Cornelius Jansen, Vandyck, Lely and Kneller. Of native artists few are of importance prior to William Hogarth (1697-1764). Throughout the eighteenth century English artists attained higher eminence in portrait painting than in other departments, and it culminated in Sir Joshua Reynolds, Thomas Gainsborough and George Romney. Barry, West and Copley gained distinction in historical compositions, especially in pictures of battles. Landscape painting was represented by Richard Wilson, who painted classical scenes with figures from heathen mythology, and by Gainsborough, already mentioned, who painted scenes of English nature and humble life. The Royal Academy of Arts, of which Reynolds was the first president, was established in London in 1769. Sir David Wilkie (1785-1841), in what is known abroad as *genre* painting, gained a European reputation that is unsurpassed. In landscape the reputation of Turner (1775-1857) 'stands alone, solitary, colossal' (Wornum). There were other distinguished landscape painters, among them Roberts, Müller and Constable, whose works exercised great influence in France. John Philip greatly distinguished himself by his scenes from Spanish life and by his mastery in color. Landseer stands by himself as a painter of animals. In affecting a more accurate and careful style of work, the Pre-Raphaelites (1840-60), while seeking to restore in their practice an early phase of Italian art, exercised a beneficial influence, while they themselves ultimately abandoned the style to which at the first they had been devoted. The list of more recent painters, some of them of high artistic powers, is too extended to be here given.

English *sculpture* was long merely an accessory to architecture, and few English sculptors are known by name till comparatively modern times. During the Renaissance period Torregiano came from Italy and executed two masterpieces in England, the tomb of the mother of Henry VII, and that of Henry himself at Westminster. The troubles of the reign of Charles I and the Commonwealth produced a stagnation in the art, and were the cause of the destruction of many valuable works. After the Restoration two sculptors of some note appeared, Grinling Gibbons, a wood-carver, and Caius Gabriel Cibber. In the eighteenth century John Flaxman imitated the classic sculpture, and Sir Francis Chantrey produced works in a pseudo-classic style. A return to nature was attempted by Westmacott, Wyatt and Bell; but the first effectual rebellion against the classic dates from Alfred Stevens (1817-75). Other sculptors of note are Sir Edward Landseer (1802-73), who executed the lions on Nelson's monument; Lord Leighton (1830-96), whose 'Athlete Struggling with the Python' and 'Sluggard' are well known; Alfred Gilbert (born 1854), who is regarded as one of the greatest figures in British sculpture; Harry Bates (1850-99), Sir George Frampton (born 1860); and W. R. Colton (born 1867).

English Channel, an arm of the Atlantic Ocean which separates England from France.

English Language.

The language spoken in England from the settlement of the Anglo-Saxons to the Norman Conquest (say 500-1066) is popularly known as Anglo-Saxon, though simply the earliest form of English. (See *Anglo-Saxons.*) It was a highly inflected and purely Teutonic tongue, presenting several dialects. The Conquest introduced the Norman-French, and from 1066 to about 1250, two languages were spoken, the native English speaking their own language, the intruders speaking French. During this period the grammatical structure of the native language was greatly broken up, inflections fell away, or were assimilated to each other; and towards the end of the period we find a few works written in a language resembling the English of our own day in grammar, but differing from it by being purely Saxon or Teutonic in vocabulary. Finally, the two languages began to mingle and form one intelligible to the whole population, Normans as well as English, this change being marked by a great infusion of Norman-French words, and English, as now constituted, being the result. English is thus, in its vocabulary, a composite language, deriving part of its stock of words from a Teutonic source and part from a Latin source, Norman-French being in the main merely a modified form of Latin. In its grammatical structure and general character, however, English is entirely Teutonic, and is classed with Dutch and Gothic among the Low German tongues. If we divide the history of the English language into periods we shall find three most distinctly marked: 1st, the Old English or Anglo-Saxon, extending down to about 1100; 2d, the Middle English, 1100-1400 (to this period belong Chaucer, Wickliffe, Langland); 3d, Modern English. A more detailed subdivision would give transition periods connecting the main ones. The chief change which the language has experienced during the modern period consists in its absorbing new words from all quarters in obedience to the requirements of advancing science, more complicated social relations, and increased subtlety of thought. At the present time the rapid growth of the sciences already existing, and the creation of new ones, have caused whole groups of words to be introduced, chiefly from the Greek.

English Literature.

Before any English literature, in the strict sense of the term, existed, four literatures had arisen in England—the Celtic, Latin, Anglo-Saxon and Anglo-Norman. The first includes such names as those of Taliesin, Llywarch Hen, Aneurin and Merlin or Merddhin. The Latin literature prior to the Conquest presents those of Aldhelm, Bede, Alcuin, Asser, Ethelwerd and Nennius. For Anglo-Saxon literature see the article *Anglo-Saxons.* With the coming of the Normans, although the *Anglo-Saxon Chronicle* was continued until 1154, the native language practically ceased for a time to be employed in literature, Latin being employed in law, history and philosophy, French in the lighter forms of literature. The Norman *trouvère* displaced the Saxon *scop*, or gleeman, introducing the *Fabliau* and the Romance. By the *Fabliau* the literature was not greatly influenced until the time of Chaucer; but the Romance attained an early and striking development in the Arthurian cycle, founded upon the legends of Geoffrey of Monmouth's Latin *History of the Britons* (1147), by Geoffrey Gaimar, Maistre Wace, Walter Map and other writers of the twelfth century. The Latin literature included important contributions to the Scholastic philosophy by Alexander Hales (d. 1245), Duns Scotus (d. 1308), and William of Occam (d. 1347), the philosophic works of Roger Bacon (1214-92), the Golias poems of Walter Map, and a long list of chronicles or histories, either in prose or verse, from Geoffrey of Monmouth to Matthew Paris.

Apart from a few brief fragments, the first English writings after the Conquest are the *Brut* of Layamon (about 1200), based on the *Brut* of Wace; and the *Ormulum*, a collection of metrical homilies attributed to Orm or Ormin, an Augustine monk. Next in importance come the rhyming chronicles, Robert of Gloucester (time of Henry III, Edward I), and Robert of Brunne or Mannyng (d. 1340), with other writers of minor consequence. Between the beginning and middle of the fourteenth century the English speech had entered upon a new phase of development in the absorption of Norman-French words. A rapid expansion of the literature followed, having as the foremost figure that of Chaucer (1340-1400), who, writing at first under French influences, and then under Italian, became in the end the most representative English writer of the time. Contemporary with him were the poets William or Robert Langland (1332-1400), John Gower (1325-1408), John Barbour (1316-95). In prose the name of John Wickliffe (1324-84) is preëminent, the English

English Literature

version of *Mandeville's Travels* being apparently of later date.

The period from the time of Chaucer to the appearance of Spenser, that is, from the end of the fourteenth to near the end of the sixteenth century, is a very barren one in English literature, in part probably owing to foreign and domestic wars, the struggle of the people to advance their political power, and the religious controversies preceding and attending the Reformation. The immediate successors of Chaucer, Occleve (1370-1454) and Lydgate (d. 1460), were not men of genius, and the center of poetic creation was for the time transferred to Scotland, where James I headed the list which comprises Andrew de Wyntoun, Henry the Minstrel or Blind Harry, Robert Henryson, William Dunbar, Gavin Douglas and Sir David Lyndsay. In England the literature was chiefly polemical, the only noteworthy prose prior to that of More being that of Reginald Peacock, Sir John Fortescue, the Paston Letters and Malory's Morte Darthur (completed 1469-70); the only noteworthy verse, that of John Skelton.

It was now that several events of European importance combined to stimulate life and enlarge the mental horizon—the invention of printing, or rather of movable types, the promulgation of the Copernican system of astronomy, the discovery of America, the Rennaissance and the Reformation. The Renaissance spread from Florence to England by means of such men as Colet, Linacre, Erasmus and Sir Thomas More (1480-1535), the last noteworthy as being at the head of a new race of historians. Important contributions to the prose of the time were the Tyndale New Testament, printed in 1525, and the Coverdale Bible (1535). The first signs of an artistic advance in poetic literature are to be found in Wyatt (1503-42) and Surrey (1516-47), who nationalized the sonnet, and of whom the latter is regarded as the introducer of blank verse. The drama, too, had by this time reached a fairly high stage of development. The *mystery* and *miracle* plays, after the adoption of the vernacular in the fourteenth century, passed from the hands of the clergy into those of the laity, and both stage and drama underwent a rapid secularization. The *morality* began to embody matters of religious and political controversy, historical characters mingled with the personification of abstract qualities, real characters from contemporary life were introduced, and at length farces on the French model were constructed, the *Interludes* of John Heywood (d. 1565) being the most important examples. To Nicholas Udall (1504–56) the first genuine comedy, *Ralph Roister Doister*, was due, this being shortly afterwards followed by John Still's *Gammer Gurton's Needle* (1566). The first tragedy, the *Ferrex and Porrex*, or *Gorboduc*, of Sackville and Norton, was performed in 1561, and the first prose play, the *Supposes* of Gascoigne, in 1566. Gascoigne and Sackville were in other respects than drama noteworthy among the earlier Elizabethans; but the figures which bulk most largely are those of Sidney and Spenser. In drama Lyly, Peele, Greene, Nash and Marlowe are the chief immediate precursors of Shakespere, Marlowe alone, however, being at all comparable with the great master. Contemporary and later dramatic writers were Ben Jonson, the second great Elizabethan dramatist, Middleton, Marston (better known as a satirist), Chapman, Heywood, Dekker, Webster, Ford, Beaumont and Fletcher and Massinger. With these were a number of minor poets of some ability. In Elizabethan prose the prominent names are those of Roger Ascham, Lyly the Euphuist, Hooker, Raleigh and Bacon, the founder in some regards of modern scientific method. The issue of the authorized version of the Bible in 1611, may be said to close the prose list of the period.

After the death of James I the course of literature breaks up into three stages, the first from 1625 to 1640, in which the survivals from the Elizabethan age slowly die away. The 'metaphysical poets,' Cowley, Wither, Herbert, Crashaw, Habbington and Quarles, and the cavalier poets, Suckling, Carew, Denham, all published poems before the close of this period, in which also Milton's early poems were composed and the *Comus* and *Lycidas* published. The second stage (1640-60) was almost wholly given up to controversial prose, the Puritan revolution checking the production of pure literature. In this controversial prose of the time Milton was easily chief. With the restoration a third stage was begun. Milton turned his new leisure to the composition of his great poems; the drama was revived, and Davenant and Dryden, with Otway, Southerne, Etherege, Wycherley, Congreve, Vanbrugh and Farquhar in their first plays, and minor playwrights, are the most representative writers of the period. Butler established a *genre* in satire, and Marvell as a satirist in some respects anticipated Swift; while in prose we have Hobbes, Clarendon, Fuller, Browne, Walton, Cotton, Pepys, Evelyn,

Bunyan, Locke and a crowd of theological writers, of whom the best known are Jeremy Taylor ('Spenser of prose' and 'Shakespere of divines'), Richard Baxter, Robert Barclay, William Penn, George Fox, Isaac Barrow, John Tillotson, Stillingfleet, Bishop Pearson, Sherlock, South, Sprat, Cudworth and Burnet. Other features of the last part of the seventeenth century were the immense advance in physical science under Boyle, Isaac Newton, Harvey and others, and the rise of the newspaper press.

Dryden's death in 1700 marks the commencement of the so-called Augustan age in English literature. During it, however, no greater poet appeared than Pope, in whom sagacity, wit and fancy take the place of the highest poetic faculty, but who was a supreme artist within the formal limits of his conception of metrical art. Against these formal limits signs of reaction are apparent in the verse of Thomson, Gray, Collins, Goldsmith and in the productions of Macpherson and Chatterton. The poets, Prior, Gay and Ambrose Phillips inherit from the later seventeenth century, Gay being memorable in connection with English opera; and there was a large number of small but respectable poets. It is in prose that the chief development of the eighteenth century is to be found. Defoe and Swift led the way in fiction and prose satire; Steele and Addison, working on a suggestion of Defoe, established the periodical essay; Richardson, Fielding, Smollett and Sterne raised the novel to sudden perfection. Goldsmith also falls into the fictional group as well as into those of the poets and the essayists. Johnson exercised during the latter part of his life the power of a literary director, with Boswell as literary dependent. The other chief prose writers were Bishop Berkeley, Arbuthnot, Shaftesbury, Bolingbroke, Burke; the historians Hume, Robertson and Gibbon; the political writers Wilkes and Junius; the economist and moral philosopher Adam Smith; the philosophical writers Hume, Bentham and Stewart; the scholars Bentley, Sir William Jones and Richard Porson; the theologians Atterbury, Butler, Warburton and Paley; and some inferior playwrights, of whom Rowe, John Home, Colley Cibber, Colman the elder, Foote and Sheridan were the most important.

With the French Revolution, or a few years earlier, the modern movement in literature may be said to have commenced. The departure from the old traditions, traceable in Gray and Collins, was more clearly exhibited in the last years of the eighteenth century in Cowper and Burns, and was developed and perfected in the hands of Blake, Bowles, and the 'lake poets' Wordsworth, Coleridge and Southey; but there were at first many survivals from the poetic manner of the seventeenth century, such as Erasmus Darwin, John Wolcot, Robert Bloomfield and Samuel Rogers. Among the earlier poets of the nineteenth century, also, were Crabbe, Scott, Hogg, Campbell, Montgomery, Mrs. Hemans, Procter ('Barry Cornwall'), Milman, L. E. Landon, Joanna Baillie and Robert Montgomery. A more important group was that of Byron, Shelley and Keats, with which may be associated the less notable names of Leigh Hunt, Thomas Moore and Landor. Among the earlier writers of fiction there were several women of note, such as Maria Edgeworth and Jane Austen. The greatest name in fiction is unquestionably that of Scott. Other prose writers were Mackintosh, Malthus, Hallam, James Mill, Southey, Robert Hall, John Foster, Thomas Chalmers, Hannah More, Cobbett, William Hazlitt, Sydney Smith, Francis Jeffrey and Lord Brougham. In the literature after 1830 poetry included among its prominent names those of Praed, Hood, Aytoun, Lord Houghton, Sidney Dobell, Alexander Smith, Gerald Massey, Charles Mackay, Philip James Bailey, William Allingham, Elizabeth Barrett Browning, Coventry Patmore, Lord Lytton (Owen Meredith), Arthur Hugh Clough, Matthew Arnold, Dante G. Rossetti, Robert Buchanan, William Morris, Lewis Morris, Jean Ingelow, Swinburne and last and greatest, Tennyson and Browning. A brilliant list of novelists for the same period includes Marryat, Bulwer, Disraeli, Dickens, Thackeray, Charles Kingsley, Charlotte Brontë, and a large number of later writers of distinction. To the historical and biographical list belong Alison, Macauley, Buckle, Carlyle, Thirwall, Grote, Milman, Froude, Lecky, Kinglake, Green, Freeman, Stubbs, etc. In science and philosophy, among the chief writers have been Whewell, Sir William Hamilton, Mansel, John Stuart Mill, Alexander Bain, Hugh Miller, Charles Darwin, Huxley, Tyndall, Max Müller, Herbert Spencer and T. H. Green. Among other prose writers of importance may be named De Quincey, Harriet Martineau, Sir Arthur Helps, Ruskin and Matthew Arnold. A large and increasing number of writers of American and colonial birth have to be added to the native contributors to present English literature in

its widest sense. (See *United States.*)

Engraving (en-grāv'ing), the art of representing objects and depicting characters on metal, wood, precious stones, etc., by means of incisions made with instruments variously adapted to the substances operated upon and the description of work intended. Impressions from metal plates are named engravings, prints or plates, those printed from wood being called indifferently wood engravings and wood cuts. While, however, these impressions are not altogether dissimilar in appearance, the processes are distinct. In plates the lines intended to print are incised, and in order to take an impression the plate is daubed over with a thick ink, which fills all the lines. The surface is then wiped perfectly clean leaving only the incised lines filled with ink. A piece of damp paper is now laid on the face of the plate, and both are passed through the press, which causes the ink to pass from the plate to the paper. This operation needs to be repeated for every impression. In the wood block, on the contrary, the spaces between the lines of the drawing are cut out, leaving the lines standing up like type, the printing being from the inked surface of the raised lines, and effected much more rapidly than plate printing.

Engraving on wood, intended for printing or impressing from, long preceded engraving on metals. The art is of Eastern origin, and at least as early as the tenth century engraving of and printing from wood blocks were common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans of the thirteenth century. For a hundred and fifty years, however, there is small indication of the practice of the art, which was at first confined to the production of block-books, playing cards and religious prints. In the fifteenth century the art of printing from engraved plates was discovered in Florence by Maso Finiguerra. Engraving had long been used as a means of decorating armor, metal vessels, etc., the engravers generally securing duplicates of their works before laying in the niello (a species of metallic enamel) by filling the lines with dark color, and taking casts of them in sulphur. The discovery of the practicability of taking impressions upon paper led to engraving upon copper plates for the purpose of printing. The date of the earliest known niello proof upon paper is 1452. The work of the Florentine engravers, however, was almost at once surpassed in Venice and elsewhere in North Italy by Andrea Mantegna (1431-1505), Girolamo Mocetto, Giovanni Batista del Porto and others. In Marc Antonio Raimondi (1475-1534), who wrought under the guidance of Raphael, and reproduced many of his works, the art reached its highest point of the earlier period, and Rome became the center of a new school, which included Marco da Ravenna (d. 1527), Giulio Bonasone (1531-72), and Agostino de Musis (fl. 1536). In the meantime, in Germany the progress of the art had been not less rapid. Of the oldest schools, the most important engraver is Martin Schongauer (1420-88). He was, however, surpassed a generation later by Albert Durer (1471-1528), who excelled both in copper and wood engraving, especially in the latter. Among his most famous contemporaries and successors were Burgkmair and Lucas Cranach. The Dutch and Flemish schools, of which Durer's contemporary, Lucas van Leyden was the head, did much to enlarge the scope of the art, either by paying increased attention to the rendering of light and shade, and the expression of local color, as in the case of Cornelius Cort and Bloemart or by developing freedom and expression of line, as in the case of Goltzius and his pupils. Rubens (1577-1640) influenced engraving through the two Bolswerts, Vorstermann, Pontius and P. de Jode, who engraved many of his works on a large size. Towards the end of the seventeenth century etching, which had before been rarely used, became more common, and was practiced with great success by Rembrandt (1607-69) and other painters of that period. In France Noel Garnier founded a school of engraving about the middle of the sixteenth century; but it produced no work of any high distinction until the reign of Louis XIV, when Nanteuil's pupil Gerard Edelinck and Gerard Audran flourished. The former was skilled in using his graver to produce color effects, the latter is famed for his engravings from Nicolas Poussin and Le Brun. But these were all surpassed about the middle of the eighteenth century by Wille (1717-1807), a German resident in Paris. Before the middle of the seventeenth century England produced little noteworthy work, availing herself principally of the work of foreign engravers, of whom many took up temporary and even permanent residence. The first English engraver of marked importance was William Hogarth (1697-1764), whose works are distinguished for character and expression. Vivares (1712-82), a Frenchman by

birth, laid the foundation of the English school of landscape engraving, which was still further developed by William Woollet (1735-85), who was also an excellent engraver of the human figure. In historical engraving a not less remarkable advance was made by Sir Robert Strange (1721-92), and Richard Earlom (1743-1822) produced some admirable works in mezzotint. In succession to these came William Sharp (1746-1824), James Bazire (1730-1802), Bartolozzi (1727-1815), James Heath, Bromley, Raimbach and others. The substitution of steel for copper plates (1820-30) gave the power of producing a much larger number of fine impressions and opened new possibilities for highly finished work. During the closing years of the eighteenth century line engraving attained a depth of color and fullness of tone in which earlier works generally are deficient, and during the nineteenth century it reached a perfection of finish which it had not previously attained. A picture, whether figure or landscape, may be translated by line engraving with all its depth of color, delicacy of tone, and effect of light and shade; the various textures, whether of naked flesh, silk, satin, woolen or velvet, all successfully rendered by ingenious modes of laying the lines and combinations of lines of varying strength, width and depth. Among engravers who have produced historical works of large size and in the line manner the names of Raphael Morghen, Longhi, Anderloni, Garavaglia and Toschi, in Italy; of Forster, Henriquel-Dupont, Bridoux and Blanchard, in France; of Burnet, Robinson, Doo, Watt and Stocks, in England, stand preeminent. In the period 1820-60 landscape engraving attained a perfection in Great Britain which it had not attained in any other country or at any other time. Among landscape engravers the names of Geo. Cooke, William Miller, Goodall, Cousen, Brandard and William Forrest hold the foremost places. In mezzotinto engraving Samuel Cousins is unrivaled. In the period 1830-45 various publications called *Annuals*, composed of light literature in prose and verse, and illustrated by highly finished engravings in steel, were very popular. The engravings were necessarily of small size, and are generally of great excellence. A number of them, both figure and landscape, are executed with such finish and completeness as to be esteemed perfect works. The unrivaled illustrations of Rogers' *Poems* and Rogers' *Italy* after Turner and Stothard belong to this period. Many of the originals of the engravings in the *Annuals* were finished pictures of large size. A great part of the difficulty in engraving on a small scale from a large picture consists in determining what details can be left out and withal preserve the full effect and character of the original. After 1870 many plates were produced by a combination of etching and dry point, a comparatively cheap and rapid process. Such works became fashionable and very popular with collectors. But while some of them have been excellent of their kind, the process is of limited resource, and the best works in this manner will not stand comparison with the masterpieces of line engraving.

Line Engraving, as implied by the term, is executed entirely in lines. The tools are few and simple. They consist of the graver or *burin*, the point, the scraper and the burnisher; an oil-stone or hone, dividers, a parallel square, a magnifying lens; a bridge on which to rest the hand; a blind or shade of tissue paper, to make the light fall equally on the plate, callipers for leveling important erasures, a small steel anvil, a small pointed hammer and punches. In etching, the following articles are required:—a resinous mixture called etching-ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a handvise; some hair pencils of different sizes, and bordering wax, made of burgundy pitch, bee's-wax and a little oil.

In engraving, the plate, which is highly polished and must be free from all scratches, is first prepared by spreading over it a thin layer of *ground*. The surface is then smoked, and one outline of the picture transferred to it by pressure from the paper on which it has been drawn in fine outlines by a black lead pencil. The picture is then drawn on the ground with the etching needle, which removes the ground in every form produced by it, and leaves the bright metal exposed. A bank of wax is then put round the plate and diluted acid poured on it, which eats out the metal from the lines from which the ground has been removed, but leaves the rest of the plate untouched. The plate is then gone over with the graver, the etched lines clearly defined, broken lines connected, new lines added, etc. Sometimes the plate is *rebitten* more than once, those parts which are sufficiently bitten in the first treatment being *stopped* with varnish, and only the selected parts exposed to after-biting. Finally, the burnisher is brought into play alternately with the

graver and point to give perfectness and finish. Such is the process for landscape engraving. In historical and portrait engraving of the highest class the lines are first drawn on the metal with a fine point and then cut in by the graver, first making a fine line and afterwards entering and reëntering till the desired width and depth of lines is attained. Much of the excellence of such engravings depends on the mode in which the lines are laid, their relative thickness, and the manner in which they cross each other. In historical engraving etching is but little used, and then only for accessories and the less important parts.

Soft-Ground Etching.—The ground, made by mixing lard with common etching-ground, is laid on the plate and smoked as before, but its extreme softness renders it very liable to injury. The outline of the subject is drawn on a piece of rough paper larger than the plate. The paper is then damped, and laid gently over the ground face upwards, and the margins folded over and pasted down on the back of the plate. When the paper is dry, and tightly stretched the bridge is laid across, and with a hard pencil and firm pressure the drawing is completed in the usual manner. The pressure makes the ground adhere to the back and the paper at all parts touched by the pencil, and on the paper being lifted carefully off, these parts of the ground are lifted with it, and the corresponding parts of the plate thus left bare are exposed to the subsequent action of the acid. The granulated surface of the paper, causing similar granulations in the touches on the ground, gives the character of a chalk-drawing. The biting-in is affected in the same manner as already described, and the subject is finished by retiring and dotting with the graver.

Stipple or Chalk Engraving, in its pure state, is exclusively composed of dots, varying in size and form as the nature of the subject demands, but few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. A great advance, however, has been made in stipple engraving by the introduction of large and varied forms of dotting in the draperies, the results almost rivaling line engraving in richness and power.

The processes of *Aquatint* and *Mezzotint* will be found described under their respective heads, the latter differing from all other styles of engraving in that the lights and gradations are scraped or burnished out of a dark ground that has first been wrought upon the plate, instead of the forms being corroded or cut into a plain surface.

The Mixed Style is based on mezzotinto, which, still forming the great mass of shading, is in this method combined with etching in the darker, and stipple in the more delicate parts. By this combination a plate will produce a larger number of good impressions than were it done entirely in mezzotinto.

Engraving on Wood.—The wood best adapted for engraving is box. It is cut across the grain in thicknesses equal to the height of type, these slices being subjected to a lengthened process of seasoning, and then smoothed for use. Every wood engraving is the representative of a finished drawing previously made on the block; the unshaded parts being cut away, and the lines giving form, shading, texture, etc., left standing in relief by excavations of varied size and character, made between them by gravers of different forms. Drawings on wood are made either with black-lead pencil alone or with pencil and India ink, the latter being employed for the broader and darker masses. It is now much the practice to photograph drawings made in black and white upon the wood instead of making the drawing on the wood block. When the drawing is put on the wood by washes or by photography instead of being entirely done by pencil lines, the engraver has to devise the width and style of lines to be employed instead of cutting in facsimile, as is the case when the drawing is made entirely in lines. The tools required for wood engraving are similar but more numerous than those of the engraver on copper or steel. Within recent years new methods of reproduction of photographs for the purpose of printing have largely replaced the art of wood engraving, and threaten to put an end to the whole art of the engraver, except in so far as it is used for the improvement of the photographic prints. The cheapness and close reproduction of nature attained by these processes have made them popular alike with publishers and readers, and books are very generally illustrated by photographic reproductions. (See also *Die-sinking, Gems.*)

Engrossing (en-gros'ing), in law, denotes *extending* a deed, that is, rewriting it out fully in fair and legible characters.

Engrossing, Forestalling, and Regrating, terms formerly in use for the purchase of corn or other commodities in order to sell again at a higher price, or in order to raise the

market price of the same. These practices were once regarded as criminal, and positive statutes against them were passed in England in 1266-67, in 1350-52, in 1552, in 1562 and in 1570. The offense of *engrossing* was described by the statute of Edward III, as the 'getting into one's possession, or buying up large quantities of corn, or other dead victuals, with intent to sell them again.'; *forestalling*, as the 'buying or contracting for any cattle, merchandise or victual, coming in the way to the market, or dissuading persons from bringing their goods or provisions there; or persuading them to enhance the price when there'; and *regrating*, 'the buying of corn or other dead victual in any market and selling it again in the same market, or within 4 miles of the place.' By the statute of Edward VI, the engrossing of corn, which included the buying of it in one market to sell it in another, was made punishable by imprisonment and pillory; and no one could carry corn from one part of the kingdom to another without a license. All the positive statutes against these offenses were repealed in 1772, but they were still found to be punishable by common law, and it was not till 1844 that they entirely ceased to rank among offenses.

Enharmonic (en-hâr-mon'ik), in music, is an epithet applied to intervals smaller than the regular divisions of the scale, *i. e.*, less than semitones. Enharmonic intervals can be produced on stringed instruments, or on specially constructed fixed-tone instruments having more than twelve divisions in the octave.

Enid (ē'nid), a city, capital of Garfield Co., Oklahoma. It has tile and iron works, lumber and flour mills, etc. Pop. 13,799.

Enkhuizen (engk'hoi-zn), a seaport of Holland, on a projection in the Zuider Zee, 29 miles northeast of Amsterdam. It had formerly a pop. of 40,000, but the silting up of the harbor has caused its decay, and its inhabitants number now 6865.

Enlistment (en-list'ment), the voluntary contract by which men are enrolled in the military or naval forces of a country, as distinguished from *conscription* (*q. v.*). In the United States and Great Britain voluntary enlistment takes the place of conscription except in time of war. In the United States men are enlisted in the Regular Army for seven years (four years in active service and three in the reserve). Duration of service in the enlisted army of Great Britain is for twelve years (three, five or nine years may be in the reserve). Men are enlisted in the Navy and Marine Corps of the United States to serve for four years.

Enlistments during the Civil War IN THE UNITED STATES. The 'calls' for troops by the government during the Civil war were as follows: April 15, 1861, 75,000 for three months; number enlisting, 93,326. May and June 25, 1862, 530,000 for three years; enlistments, 714,213. July 2, 1862, 300,000 for three years; enlistments, 431,958. August 4, 1862, 300,000 for nine months; enlistments, 87,000. The 'calls' from October 17, 1863, were orders for drafts; on that day was issued a 'call' for 300,000 for three years, and February 1, 1864, a 'call' for 200,000 for the same term—these two 'calls' bringing 374,807 into service. March 14, 1864, 200,000 men were called for, for three years, resulting in 284,021 entering the service. July 18, 1864, 500,000 men for 1, 2 and 3 years were called for; number obtained, 384,882. The last 'call,' December 19, 1864, for 300,000, for 1, 2 and 3 years, brought 204,568 into service. The whole number called for was 2,759,049; number obtained, 2,656,553. Probably not more than 50,000 drafted men performed personal service, substitutes being obtained. The 'substitute fund,' consisting of money paid as a release from service, which was used as a 'bounty fund' for volunteers, amounted to $25,902,000.

Ennis, a city of Ellis Co., Texas, 34 miles S. of Dallas. It has cotton gins, oil and lumber mills, etc. Pop. 5669.

Ennius (en'ni-us), QUINTUS, an early Latin poet, considered by the Romans as the father of their literature, was born at Rudiæ, near Brundusium, in 239 B.C.; died in 169 B.C. He wrote an epic, *Scipio*, in hexameters; Roman annals, tragedies and comedies, satires, epigrams, precepts, etc. His whole works are supposed to have been extant up to the thirteenth century, but nothing now remains but fragments quoted from other ancient authors.

Enns (ens), a river in Austria, which rises in the Alps of Salzburg, flows W., then E. N. E., then N. N. W. entering Upper Austria (Ober der Enns), which for 15 miles it separates from Lower Austria (Unter der Enns), and finally enters the Danube a little below the town of Enns (4438 inhabitants). Total course about 160 miles.

Enoch (ē'nok), (1) The eldest son of Cain, who called the city which he built after his name (Gen., iv, 17).

(2) One of the patriarchs, the father of Methuselah. He 'walked with God; and he was not, for God took him' (Gen., v, 24), at the age of 365 years. The words quoted are usually interpreted to mean that Enoch did not die a natural death, but was removed as Elijah was.

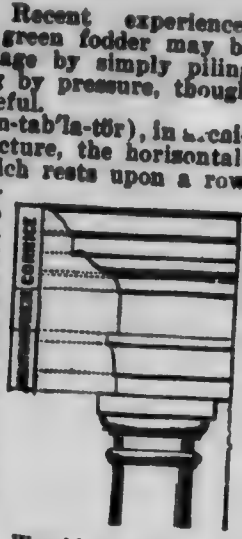
Enoch, Book of, an apocryphal book of an assumedly prophetical character, to which considerable importance has been attached on account of its supposed quotation by St. Jude in the 14th and 15th verses of his epistle. It is referred to by many of the early fathers; is of unknown authorship, but was probably written by a Palestinian Hebrew. Its date is also uncertain, critical conjecture ranging from 144 B.C. to 132 A.D. Until the close of last century it was known in Europe only by the references of early writers, and by the passage of St. Jude supposed to be founded on it. On his return from Egypt, Bruce brought with him from Abyssinia three manuscripts containing a complete Ethiopic translation of it. It has since been repeatedly published, translated and criticised in Europe.

Enos (ā'nōs), a seaport of European Turkey, in Roumelia, 38 miles N. W. of Gallipoli, on the Ægean Sea, in the Gulf of Enos. Pop. 8000.—The Gulf of Enos is 14 miles in length by about 5 in breadth.

Ensign (en'sin), formerly, in the British army, the officer who carried the flag or colors of an infantry regiment; for this title, second lieutenant has been substituted. In the United States navy the office of ensign ranks next below that of lieutenant. In naval language the ensign is the flag over the poop or stern which distinguishes the ships of different nations.

Ensilage (en'si-lij), in agriculture, a mode of storing green fodder, vegetables, etc., in receptacles called 'silos.' These are usually elevated circular structures made of wood, brick concrete or stone. The fodder, etc., is cut and mixed, placed in the silo, pressed down, and kept compressed by its own weight until in a state fit for feeding. It undergoes a slight fermentation, and attains a slightly acid taste and smell, which is particularly grateful to cattle. The modern system of ensilage dates from about 1875, but the practice was known to the ancient Romans, and the system has been common in Mexico for centuries. Such advantages are claimed for it, as that in a wet season grass can be made into ensilage instead of hay, and that there is little loss of nutritive elements, while it has great feeding powers. Recent experience seem to show that green fodder may b converted into ensilage by simply pilin up and consolidating by pressure, thoug the method is wasteful.

Entablature (en-tab'la-tūr), in architecture, the horizontal continuous work which rests upon a row of columns, and belongs especially to classical architecture. It consists of three principal divisions—the *architrave* immediately above the abacus of the column, next the *frieze*, and then the *cornice*. In large buildings projections similar to and known also as entablatures are often carried round the whole edifice, or along one front of it.



Entablature of Tuscan Column.

Entada (en-tā'da), a genus of leguminous plants, suborder Mimoseæ, containing about a dozen species of climbing, tropical shrubs, remarkable for the great size of their pods. *E. scandens* has pods which measure from 6 to 8 feet in length. The seeds have a hard, woody and beautifully polished shell, and are often made into snuff-boxes, scent-bottles, etc.

Entail (en-tāl'). in law, the settlement of an estate by which a freehold is limited to a person and the heirs of his body, with such particular restrictions as the donor may specify. Entailed estates are divided into *general* and *special*, the former when the estate is given to the donee and his heirs without exception, the latter when the estate is limited to certain heirs to the exclusion of others.

Entasis (en'ta-sis), in architecture, the delicate and almost imperceptible swelling of the lower part of the shaft of a column, to be found in almost all the Grecian examples, adopted to give a more pleasing effect to the eye.

Entelechy (en-tel'e-ki), in the peripatetic philosophy, an object in its complete actualization, as opposed to merely potential existence.

Entellus (en-tel'us), an East Indian species of monkey, of the genus *Semnopithecus* (*S. entellus*). It has yellowish fur, with a face of a violet tinge, and a long and powerful tail, which, however, is not prehensible. It receives divine honors from the natives of India, by whom it is termed *Hoonuman*.

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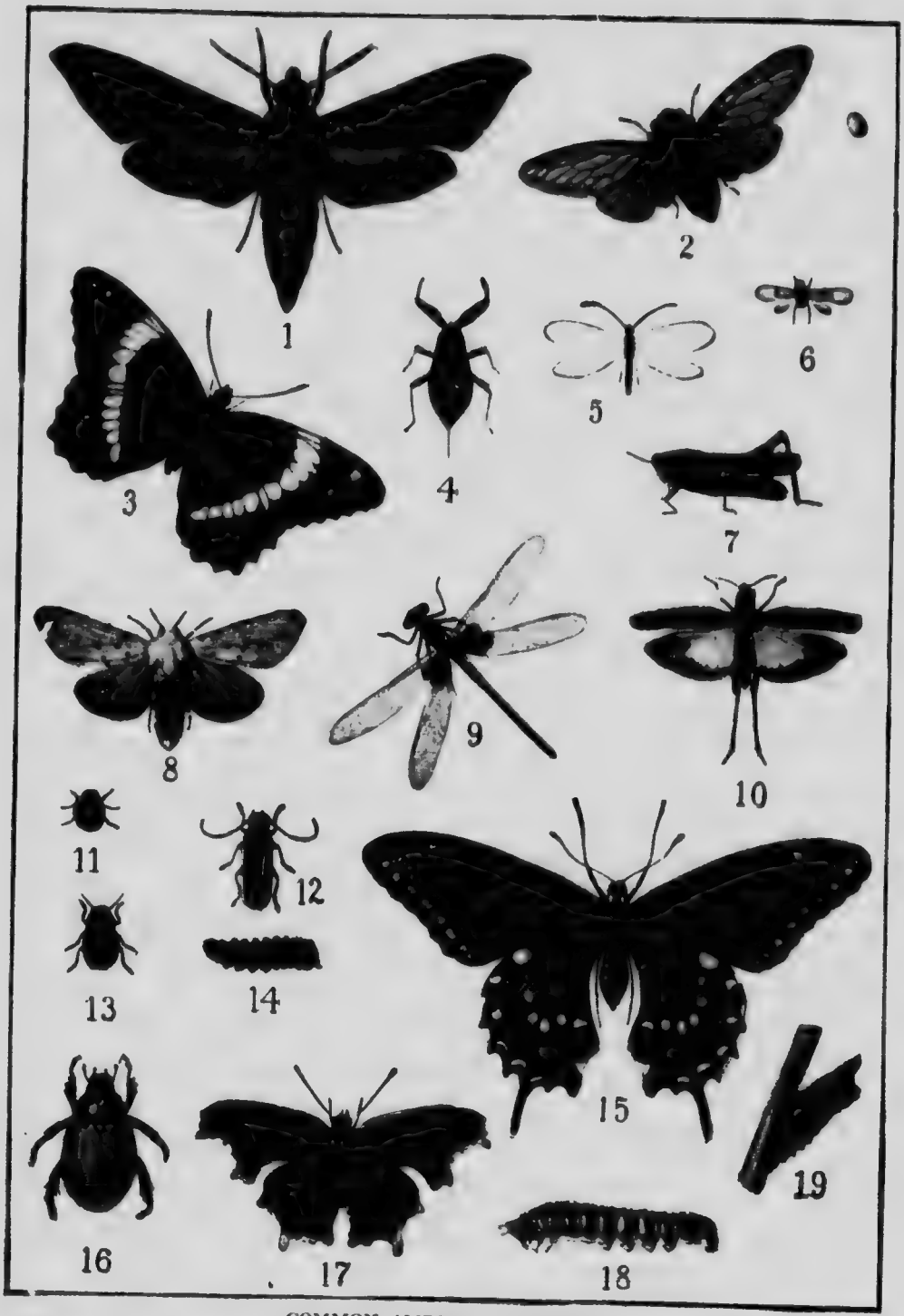


COMMON AMERICAN INSECTS

1. Vine feeder. 2. Seventeen-year locust. 3. Butterfly. 4. Water scorpion. 5. Gadfly. 6. Apple-tree plant louse. 7. Grasshopper. 8. Tiger moth. 9. Dragon-fly. 10. Locust. 11. Lady bird. 12. Round-headed apple-tree borer. 13. Leaf beetle. 14. Larva of No. 12. 15. Star butterfly. 16. Goldsmith beetle. 17. Comma butterfly. 18. Larva of No. 15. 19. Chrysalis of No. 15.

Costly temples are dedicated to these animals; hospitals are built for their reception, and large fortunes are bequeathed for their support. The entellus abounds in India; enters the houses and gardens of the natives, plunders them of fruit and eatables, and the visit is even considered an honor.

Enteric Fever (en-ter'ik). See *Typhoid Fever*.

Enteritis (en-te-rī'tis; Greek, *enteron*, intestine), inflammation of the intestines. There are several forms of the disease of great severity and very fatal. A common form, which is of the nature of an intestinal cartarrh, generally yields to simple treatment; but other forms are of great danger, and demand skilled and attentive treatment.

Entomology (en-tu-mol'u-ji), the branch of zoology which treats of the insects, the name being from Greek *entŏma*, animals 'cut in,' the transverse division or segmentation of the body being their most conspicuous feature. The true insects are those animals of the division Arthropoda or Articulata distinguished from the other classes of the division by the fact that the three divisions of the body—the head, thorax and abdomen—are always distinct from one another. There are never more than three pairs of legs in the perfect insect, and these are all borne upon the thorax. Each leg consists of from six to nine joints. The first of these is called the 'coxa,' and is succeeded by a short joint called the 'trochanter.' This is followed by a joint, often of large size, called the 'femur,' succeeded by the 'tibia,' and this has articulated to it the 'tarsus,' which may be composed of from one to five joints. Normally two pairs of wings are present, but one or other may be wanting. The wings are expansions of the sides of the second and third sections of the thorax, and are attached by slender tubes called 'nervures.' In the beetles the anterior pair of wings becomes hardened so as to form protective cases for the posterior membranous wings, and are called in this condition 'elytra' or 'wing-cases.' Respiration is effected by means of air tubes or tracheæ, which commence at the surface of the body by lateral apertures called 'stigmata' or 'spiracles,' and ramify through every part of the body. The head is composed of several segments amalgamated together, and carries a pair of feelers or 'antennæ,' a pair of eyes, usually compound, and the appendages of the mouth. The thorax is composed of three segments, also amalgamated, but generally pretty easily recognized. The abdominal segments are usually more or less freely movable upon one another, and never carry locomotive limbs; but the extremity is frequently furnished with appendages connected with generation, and which in some cases serve as offensive and defensive weapons (stings). The organs of the mouth take collectively two typical forms, the masticatory and the suctorial, the former exemplified by the beetles, the latter by the butterflies, in which the mouth is purely for suction. The alimentary canal consists of the œsophagus or gullet, a crop, a gizzard, a stomach and an

Figure Showing Parts of Insects.

Coleopter (*Cicindela campestris*). *a*, Head. *b*, Thorax. *c*, Abdomen. *d d*, Elytra. *e e*, Wings. *f f*, Antennæ.

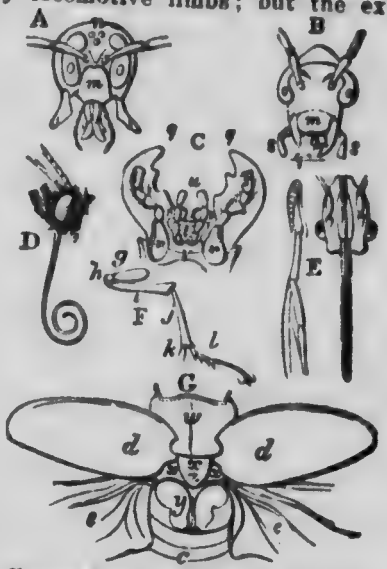


Figure Showing Parts of Insects.

A, B, C, Mandibulate Mouth. A, Head of Hornet, and upper side of mouth. *m*, Clypeus. *n*, Ocelli, stemmata, or simple eyes. *o*, Compound eyes. B, Head of Beetle, and C, under side of mouth of Beetle. *m*, Clypeus. *o*, Eyes. *p*, Labrum or upper lip. *q*, Mandibles or upper jaws. *r*, Maxillæ or lower jaws. *s*, Maxillary palpi. *t*, Labrum or under lip. *u*, Labial palpi. *v*, Mentum or chin.—D and E, Haustellate Mouths. D, Spiral sucker of a Butterfly, called also Antlia. E, Straight sucker of a Plant-bug (Pentatoma) called Haustellum.—F, Leg of Stag-beetle. *g*, Coxa. *h*, Trochanter. *i*, Femur. *j*, Tibia. *k*, Calcaria or spurs. *l*, Tarsus, which in this instance is pentamerous, or consisting of five pieces.—G, Thorax of Stag-beetle. *c*, Abdomen, *dd*, Elytra. *ee*, Wings. *w*, Prothorax. *x*, Mesothorax. *y*, Metathorax. *y*, Scutellum.

intestine, terminating in a cloaca. There is no regular system of blood-vessels; the most important organ of the circulation is a contractile vessel situated dorsally and called the 'dorsal vessel.' The nervous system is mainly composed of a series of ganglia placed along the ventral aspect of the body and connected by a set of double nerve cords. The sexes are in different individuals, and most insects are oviparous. Reproduction is generally sexual, but non-sexual reproduction also occurs. (See *Parthenogenesis.*) Generally the young are very different from the full-grown insect, and pass through a 'metamorphosis' before attaining the

Diagram of the anatomy of an Insect. *an*, Antennæ; *e*, Eye; *m*, Mouth; *g*, Gullet; *sg*, Salivary gland; *s*, Stomach; *f*, Tubes supposed to represent the kidneys; *i*, Intestines; *c*, Chamber (cloaca) into which the intestine opens; *v*, Vent; *h*, Heart; *n*, Nervous system; *l*, Bases of the legs.

mature stage. When this metamorphosis is complete it exhibits three stages—that of the larva, caterpillar or grub, that of the pupa or chrysalis, and that of the imago or perfect winged insect. Insects have been divided into three sections—*Ametabŏla*, *Hemimetabŏla* and *Holometabŏla*, according as they undergo no metamorphosis, an incomplete one, or a complete one. The young of the Ametabola differ from the adult only in size. They are all destitute of wings; the eyes are simple and sometimes wanting. The *Hemimetabŏla* undergo an incomplete metamorphosis, the larva differing from the imago chiefly in the absence of wings and in size. The pupa is usually active, or if quiescent capable of movement. In the *Holometabŏla* the metamorphosis is complete, the larva, pupa and imago differing greatly from one another in external appearance and habits. The larva is wormlike and the pupa quiescent. The section *Ametabŏla* (which, in the opinion of many naturalists, are scarcely within the pale of the true *Insecta*) is divided into three orders —*Anoplūra* (lice), *Mallophaga* (bird-lice), and *Thysanūra* (*springtails*). The section *Hemimetabŏla* comprises the orders *Hemiptĕra* (cicadas, bugs, plant lice, etc.), *Orthoptĕra* (cockroaches, crickets, grasshoppers, locusts, earwigs etc.), and *Neuroptĕra* (dragon-flies, May-flies, white ants, etc.). The *Holometabŏla* comprises the orders *Aphaniptĕra* (fleas), *Diptĕra* (gnats, botflies, gadflies, mosquitoes, house-flies, etc.), *Lepidoptĕra* (butterflies and moths), *Hymenoptĕra* (bees, wasps and ants), *Strepsiptĕra* (stylops, minute and parasites), and *Coleoptĕra*, (lady-birds, glowworms, cockchafers, weevils, and all of the beetle tribe). A division is sometimes made into *Mandibulate* and *Haustellate* groups, the oral apparatus of the former being adapted for mastication, the latter for imbibition of liquid food. Both types are, however, sometimes modified and occasionally combined.

Entomology, Economic. Insects of various species are very destructive to trees and cultivated plants, and the ravages committed by them on farms cause losses amounting to many millions of dollars annually. The terrible losses caused by great swarms of locusts have been historical for centuries, and in our day there is scarcely a cultivated plant that escapes injury by some insect species. Within recent years certain species of moths have been introduced to this country, the larvæ of which are doing very serious injury to forest and shade trees. In addition are the clothes moth and other insects which attack furniture, the botflies which attack horses, sheep and cattle, and the species of mosquitoes which spread epidemic diseases, such as yellow fever and malaria, among men. Injurious insects are very numerous in species and countless in numbers, and the study of their habits and of the best way to prevent their ravages has given rise to a broad field of entomological study. In many cases very encouraging success has been attained, in others the difficulty in dealing with destructive and disease-bearing insects has proved almost insuperable. The common house-fly is one of the species against which a crusade has recently been instituted, it being known to convey the germs of disease on its feet. Much has been done in the field of economic entomology, but much remains to be done and the war against hurtful insects goes actively on.

Entomophaga (en-tu-mof'a-ga; 'insect eaters'), a term applied to (1) a group of hymenopterous insects whose larvæ feed upon living insects. (2) A tribe of marsupials, as the opossums, bandicoots, etc., which are insectivorous, though not exclusively so. (3) A section of the edentates, as the ant-eater and pangolin.

Entomostraca (en-tu-mos'trâ-kâ), a sub-class of the crustaceous animals, composing all ex-

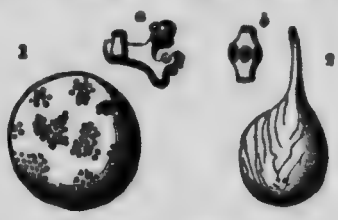
cept the stalk-eyed and sessile-eyed groups. The groups usually noted by it are the *Ostracōda*, as *Cypris*; *Copepōda*, as *Cyclops*; *Cladocēra*, as *Daphnia* (water-flea); *Branchiopōda*, as the brine-shrimp and the glacier-flea; *Trilobites*, all of which are extinct; *Merostomāta*, of which the king-crab is the only living genus. No definition can be framed to include all these groups, each of which is now usually regarded as a distinct order.

Entomostraca.

1, *Cyclops quadricornis*: *a*, Eye; *c c*, Eggs. 2, Cypris: *a*, Eye.

Entophyte (en'tu-fīt), a term applied to minute plants growing on or in living animals, or in the tissues of other plants. They all belong to the orders Algæ or Fungi. In many cases the growth of the plant appears to be a consequence of the diseased state of the structure, which, in this condition, presents the circumstances favorable for the development of the germ or spore into the plant. Epidemic diseases, as cholera, have been ascribed to these spores of germs being conveyed through the air, water, etc. (See *Germ Theory*.)

Entozoa (en-tu-zō'a), a general name for those annulose parasitical animals which infest the bodies of other animals. Some are found in the intestines, other in the liver, brain, muscles and other tissues. They pass through



Entozoa Magnified.

1, *Cœnūrus cerebrālis* (producing the staggers in sheep). *a*, Heads (shown on the surface) separately. 2, *Cysticercus cellulosæ* (causing the measles in pigs). *b*, Head.

different stages in their development, and at each stage occupy a different tissue and usually a different animal. Thus, the cystic or bladder worm, whose presence in the brain of sheep causes staggers, is the immature form of the tapeworm of the dog, etc. The number of species is being reduced as the relations of the different forms are studied. They all belong to the class *Scolēcida*, and are included in the orders *Trematōda* (flukes), *Tænioda* (tapeworms), *Acanthocephala* (intestinal worms), *Gordiacea* (hairworms), and a section of the *Nematōda* (*Trichina*, etc.).

Entre Rios (en'tre rē'os; 'between rivers'), a province of the Argentine Republic, lying between the Uruguay and the Paraná; area estimated at 28,784 sq. miles; pop. 376,600. The province is largely pastoral. Capital, Conception, with pop. of 10,000.

Entropium (en-trō'pi-um), in medicine, an inversion or turning in of the eyelashes, consequent either on loss of substance or on inflammatory swelling of the lid.

Entropy (en-trō'pi), in thermodynamics, a certain mathematical expression whose value does not change when the substance under discussion undergoes a reversible compression or expansion, while not receiving any heat from external sources nor giving any up to them; but which is increased or diminished by the amount of heat entering or leaving the body. In general the change of entropy that a body experiences when it passes from one state to another by a reversible process is found by dividing the heat that the body absorbs during every infinitesimal part of the process of transformation by the absolute temperature of the body.

Environment (en-vī'ron-ment), a word frequently used in evolutionary and sociological discussions to signify the modifying influences of surroundings. No plant or animal can be understood as an entity, since the whole life is made up of action and reaction between the organism and its environment. There is great disagreement among scientists as to the relative part played by heredity and environment in determining what the individual shall be; but the influence of outside conditions has been recognized by naturalists from the time of Hippocrates down. Buffon, Treviranus and Geoffroy St. Hilaire regarded the surroundings as directly effecting changes in the organism; Erasmus Darwin and Lamarck, as indirectly effecting them. Charles Darwin allowed a measure of truth to both these positions.

Envoy (en'voi), a person deputed by a ruler or government to negotiate a treaty or transact other business, with a foreign ruler or government. We usually apply the word to a public minister sent on a special occasion or for one particular purpose; hence an *envoy* is distinguished from an *ambassador* or permanent resident at a foreign court, and is of inferior rank.

Enzyme (en'zīm), any of the unorganized ferments, such as diastase, cytase, trypsin, etc., which induce fermentive changes in organic substances. Under some conditions enzymes have the property of facilitating chemical interchanges between certain bodies without entering into the composition of the products that results. Enzymes play an important part in the digestive processes and are of vital importance in the life history of all plants. They are usually soluble in water and they generally lose their activity at a temperature above 100° F.

Eocene (ē'ō-sēn), in geology, a term applied to the lower division of the Tertiary strata, from Gr. *ēōs*, dawn, and *kainos*, recent, because remains of existing organic species first occur here. The Eocene beds are arranged in two groups, termed the Lower and Upper Eocene; the strata formerly called Upper Eocene being now known as Oligocene. They consist of marls, limestones, clays and sandstones, and are found in the Isle of Wight and in the southeast of England and northwest of France, in Central Europe, Western Asia, Northern Africa and the Atlantic coast of North America.

Eolian Harp (ē-ō-li'an). See *Æolian Harp*.

Eolithic Period (ē-ō-lith'ik), in archæology, the early part of the palæolithic period of prehistoric time.

Eon de Beaumont. See *D'Eon de Beaumont*.

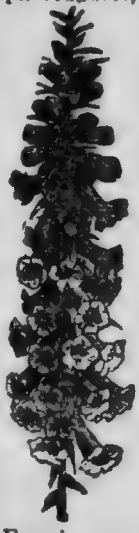
Eos (ē'os), among the ancient Greeks the goddess of the dawn. See *Aurora*.

Eötvös (eut'veush), Baron Jozsef, a Hungarian statesman and author, born in 1813; died in 1871. He completed his studies at the University of Pesth in 1831. He had already, before leaving the university, produced three dramas—*The Critics*, *The Wedding* and *Revenge*, the last a tragedy—all which were well received. He became a friend of Kossuth, and distinguished himself as a journalist and author of the popular party. He was minister of public instruction in 1848, but resigned the same year. In 1867 he was again appointed minister of public instruction, which place he retained till his death. Among his works are the novels: *The Carthusian*, *The Village Notary* (translated into English), and *Hungary in 1514*—giving vivid pictures of Hungarian life in modern and more remote epochs.

Eozoic Rocks (ē-o-zō-ik), the name given to the oldest fossiliferous rocks, such as the Laurentian and Huronian of Canada, from their being supposed to contain the first or earliest traces of life in the stratified systems.

Eozoön (ē-o-zō'on), a supposed gigantic fossil foraminifer found in the limestone of the Laurentian rocks of Canada, whence the name *Eozoön Canadense*; and in the Archæan rocks of Germany; so called from Gr. *ēōs*, dawn, and *zōon*, an animal, as being the oldest form of life traceable in the past history of the globe. It is very doubtful, however, that these are true fossils, geologists now generally regarding them as of mineral origin.

Epacris (e-pac'ris), a genus of monopetalous exogens, the typical genus of the nat. order Epacridaceæ, distinguished by having a colored calyx with many bracts, a tubular corolla with smooth limb, stamens affixed to the corolla, and a five-valved, many-seeded capsule. The species are shrubby plants, with axillary, white, red or purple flowers, generally in leafy spikes. Among those cultivated in Britain we may mention *E. grandiflora*, which has flowers nearly an inch in length, of a brilliant reddish purple at the base and pure white at the apex. The order Epacridaceæ consists of plants allied to the heaths, chiefly natives of Australia. The fruit of some species is eaten under the name of Australian cranberry, and they are cultivated in greenhouses for their flowers.



Epacris grandiflora (garden variety).

Epact (ē'pakt; Gr. *epaktos*, added), in chronology, the excess of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months. The epacts then are *annual* and *menstrual* or *monthly*. Suppose the new moon to be on the 1st of January; the month of January containing 31 days, and the lunar month only 29 days, 12 hours, 44 minutes, 3 seconds; this difference 1 day, 11 hours, 15 minutes, 57 seconds, is the *menstrual epact*. The *annual epact* is nearly 11 days; the solar year being 365 days, and the lunar year 354. The epacts were once of some importance in ecclesiastical chronology, being used for finding when Easter would fall.

Epaminondas (e-pa-mi-non'das), an ancient Greek hero, who, for a short time, raised his country Thebes, to the summit of power and prosperity. He was born about 418 B.C. and killed at the battle of Mantineia in 362 B.C. He took the leading part in the struggle during which Spartan supremacy in Greece was destroyed, and the supremacy of Thebes temporarily secured. Four times he successfully invaded the Peloponnesus at the head of the Thebans, but after his death Thebes soon sank to her former secondary condition. Throughout life he was distinguished for the friendship subsisting between him and Pelopidas, with whom he served in the Spartan campaign in 385 B.C. His character is one of the finest recorded in Greek history, and his virtues have been praised by both Xenophon and Plutarch.

Eparch (ep'ärk), in Greece, the governor or perfect of a provincial division called an *eparchy*, a subdivision of a monarchy or province of the kingdom. In Russia an eparchy is the diocese or archdiocese of a bishop or archbishop.

Epaulement (e-pal'ment), in fortification, a term for the mass of earth or other material which protects the guns in a battery in front and on either flank.

Epaulet (ep'al-et), EP'AULETTE (Fr. *épaule*, the shoulder), an ornamental shoulder-piece belonging to a military or other dress. Epaulettes were worn in the British army till 1855, and are still worn in the navy by all officers of and above the rank of lieutenant, and by some civil officers. From Britain they naturally made their way to the United States, and in fact are in general use in the armies and navies of modern nations.

Epée (ė-pā), CHARLES MICHAEL, ABBE DE L', a French philanthropist, born in 1712; died in 1789. He had chosen the clerical profession, but had to leave the church on account of Jansenist opinions. The great object of his life was the instruction of the deaf and dumb, for whom he spent his whole income, besides what was contributed by benevolent patrons, erecting an institution for them at his own cost. He left several works on his method of instruction. (See *Deaf and Dumb.*)

Epeira (e-pī'ra), a genus of spiders, comprising the largest and best-known European species. *E. diadēma*, the common garden spider, is a handsomely marked species.

Eperjes (e-per'yesh), a town of Northern Hungary, on the Tarcza, the seat of a Greek Catholic bishop. Pop. 13,098.

Epernay (ep-er-nā), a town of N. E. France, department Marne, on the Marne, the central depôt of the wine trade of Champagne. The vast wine cellars of the town form a labyrinth of galleries cut in the tufa or calcareous soil of the district. Pop. (1906) 20,291.

Ephah (ē'fa), or BATH, a Hebrew measure of capacity, containing, according to one estimate or calculation, 8.6696 gallons; according to another only 4.4286 gallons.

Ephemera (e-fem'e-ra), the typical genus of the insect family Ephemeridæ, neuropterous insects, so named from the extreme shortness of their lives in the perfect state. They are known as *May-flies* or *day-flies*, and are characterized by the slenderness of their bodies; the delicacy of their wings, which are erect and unequal, the anterior being much the larger; the rudimentary condition of the mouth; and the termination of the abdomen in three filiform appendages. In the state of larvæ and pupæ they are aquatic and exist for years. When ready for their final change they creep out of the water, generally towards sunset of a fine summer evening, beginning to be seen generally in May. They shed their whole skin shortly after leaving the water, propagate their species, and die, taking no food in the perfect state. The May-fly is well known to anglers, who imitate it for bait.

Ephemeris (e-fem'e-ris), an astronomical almanac, such as the *Nautical Almanac and Astronomical Ephemeris*, published by order of the British Admiralty. (See *Almanac.*)

Ephesians (e-fēs'yans), THE EPISTLE TO THE, a canonical epistle addressed by the apostle Paul to the church which he had founded at Ephesus. It was written during his first captivity at Rome, immediately after he had written the Epistle to the Colossians (A.D. 62); and was sent by the hands of Tychicus, who also bore the message to the church at Colossæ.

Ephesus (ef'e-sus), an ancient Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities, on the south side of the Caystrus, near its mouth. It was at one time the grand emporium of Western Asia, having a convenient and spacious harbor. The apostle Paul visited Ephesus and established a Christian church there, to which he dedicated one of his epistles. It was famous for its temple of Artemis (Diana), called *Artemision*, the largest

and most perfect model of Ionic architecture, and reckoned one of the seven wonders of the world. The first great temple, begun about B.C. 650 and finished after 120 years, was burnt by the notorious Herostratus in order to perpetuate his name in B.C. 356 (the night of Alexander the Great's birth). A second and more magnificent was then erected, which was burned by the Goths in A.D. 262. Some interesting remains have recently been discovered by excavation. Several church councils were held there, especially the third ecumenical council of 431, at which Nestorius was condemned. The site of the city is now desolate; near it is a poor village, Aiasoluk.

Ephod (ef'od), a species of vestment worn by the Jewish high priest over the second tunic. It consisted of two main pieces, one covering the back the other the breast and upper part of the body, fastened together on the shoulders by two onyx stones set in gold, on each of which were engraved the names of six tribes according to their order. A girdle or band, of one piece with the ephod, fastened it to the body. Just above the girdle, in the middle of the ephod, and joined to it by little gold chains, rested the square breastplate with the Urim and Thummim. The ephod was originally intended to be worn by the high priest exclusively, but a similar vestment of an inferior material seems to have been in common use in later times among the ordinary priests.

Ephors (ef'ors), EPH'ORI, magistrates common to many Dorian communities of ancient Greece, of whom the most celebrated were the Ephori of Sparta. They were five in number, were elected annually, and both the judicial authority and the executive power were almost entirely in their hands. Their power became an intolerable burden, especially to the kings, and in 225 B.C. Cleomenes murdered the whole college and abolished the office.

Ephraem Syrus (e'fra-em si'rus), that is 'Ephraim the Syrian,' writer of the Syrian Church, born at Nisibis about 306 A.D.; died at Edessa in 373 or 378. He wrote several commentaries on Scripture, numerous homilies and other works (as well as hymns), which have come down to us partly in Syriac, partly in Greek, Latin and Armenian translations. His works have been published in Syriac, Greek and Latin.

Ephraim (e'fra-im), the younger son of Joseph, and the founder of one of the twelve tribes of Israel. When the Israelites left Egypt the Ephraimites numbered 40,500, and their possessions in the very center of Palestine included most of what was afterwards called Samaria.

Epic (ep'ik), a poem of the narrative kind. Some authorities restrict the term to narrative poems written in a lofty style and describing the exploits of heroes. Others widen the definition so as to include not only long, narrative poems of romantic or supernatural adventure, but also those of a historical, legendary, mock-heroic or humorous character. Epic is distinguished from drama in so far as the author frequently speaks in his own person as narrator; and from lyrical poetry by making the predominant feature the narration of action rather than the expression of emotion. Among the more famous epics of the world's literature may be noted: Homer's *Iliad* and *Odyssey;* Virgil's *Æneid;* the German *Nibelungenlied;* the Anglo-Saxon poem of *Beowulf;* the French *Song of Roland;* Dante's *Divina Commedia;* Tasso's *Gierusalemme Liberata;* Arisoto's *Orlando Furioso;* Milton's *Paradise Lost;* Spenser's *Fairy Queen;* Camoens' *Lusiad* (Portuguese); and Firdusi's *Shah Nameh* (Persian). Hesiod's *Theogony;* the poetic *Edda;* the Finnish *Kalewala;* the Indian *Mahâbhârata* may be described as collections of epic legends. The historical epic has an excellent representative in Barbour's *Bruce;* and specimens of the mock-heroic and humorous epic are found in *The Battle of the Frogs and Mice; Reynard the Fox;* Butler's *Hudibras;* and Pope's *Rape of the Lock.* Few efforts have been made to produce epics within the recent centuries and these few have had little success. The versified narrative has now been replaced with the prose story.

Epicharmus (ep-i-kär'mus), a Greek writer and philosopher of the Pythagorean school, born in the island of Cos about 540 B.C.; died in B.C. 450. He removed to Syracuse, where at the court of Hieron he spent the remainder of his life. He is credited with the invention of written comedy.

Epictetus (e-pik-tē'tus), a Greek Stoic philosopher, born in Phrygia about A.D. 60. He lived long at Rome, where, in his youth, he was a slave. Though nominally a Stoic, he was not interested in Stoicism as an intellectual system; he adopted its terminology and its moral doctrines, but in his discourses he appeared rather as a moral and religious teacher than as a philosopher. His doctrines approach more nearly to Christianity than those

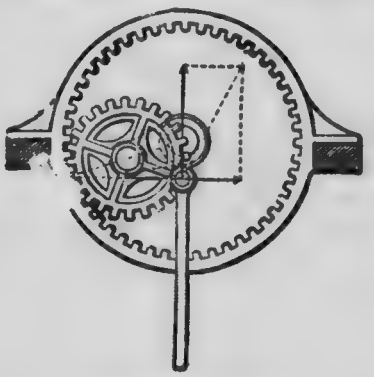
of any of the earlier Stoics, and although there is no trace in what is recorded of them of his having been directly acquainted with Christianity, it is at least probable that the ideas diffused by Christian teachers may have indirectly influenced them. The excellence of his system was universally acknowledged. When Domitian banished the philosophers from Rome (A.D. 94) Epictetus retired to Epirus, where he is supposed to have died. His disciple Arrian collected his opinions, which are preserved in two treatises called the *Discourses of Epictetus* and the *Manual* or *Enchiridion*.

Epicurus (ep-i-kū'rus), a Greek philosopher, founder of the Epicurean school, was born in the island of Samos in B.C. 342; died at Athens, in B.C. 270. He settled at Athens in B.C. 306, and purchased a garden in a favorable situation, where he established a philosophical school. Here he spent the remainder of his life, living in a simple manner and taking no part in public affairs. His pupils were numerous and enthusiastically devoted to him. His theory of the universe was based on the atomic theory of Democritus. The fundamental principal of his ethical system was that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. He endeavored, however, to give a moral tendency to this doctrine. He exalted the pure and noble enjoyments derived from virtue, to which he attributed an imperishable existence, as incalculably superior to the passing pleasures which disturb the peace of mind, the highest good, and are therefore detrimental to happiness. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented; but while it is not open to the charges of gross sensualism which have been brought against it, it cannot be considered as much better than a refinement of sensualism. In ancient times his philosophy appears to have been more popular in Greece than in Rome, although his disciples were numerous in both, and the Latin poem of Lucretius, *De Rerum Natura*, is a poetical exposition of his doctrines. Epicurus was a very voluminous writer, but few of his writings are extant, what we possess comprising only some fragments of a *Treatise on Nature*, two letters, and detached passages. Lucretius, Cicero, Pliny and Diogenes Laertius are our chief authorities for his doctrines.

Epicycle (ep'i-sī-kl), in the ancient astronomy, a small circle supposed to move round the circumference of a larger, a hypothetical mode of representing the apparent motion of the planets, which were supposed to have such a motion round the circumference of a large circle, called the *deferent*, having the earth in its center.

Epicycloid (ep-i-sī'kloid), in geometry, a curve generated by the movement of a circle upon the convex side of another curve, that generated by the movement of a circle upon the concave side of a fixed curve being called a *hypocycloid*.

Epicycloidal Wheel (ep-i-sī-kloi'dal wēl), a wheel or ring fixed to a framework, toothed on its inner side, and having in gear with it another toothed wheel of half the diameter of the first, fitted so as to revolve about the center of the latter. It is used for converting circular into



Epicycloidal Wheel.

alternate motion, or alternate into circular. While the revolution of the smaller wheel is taking place any point whatever on its circumference will describe a straight line, or will pass and repass through a diameter of the circle, once during each revolution. In practice, a piston-rod or other reciprocating part may be attached to any point on the circumference of the smaller wheel.

Epidamnus (ep-i-dam'nus). See *Durazzo*.

Epidaurus (ep-i-dą'rus), a town and seaport of ancient Greece, situated in Argolis, in the Peloponnesus, particularly celebrated for its magnificent temple at Æsculapius, which stood on an eminence not far from the town. It had also temples of Artemis, Dionysus, Aphrodite and Hera, and a splendid theater still in fair preservation. The site is now occupied by the village *Epi-*

daurо, where a congress met in 1822 and promulgated the 'Constitution of Epidaurus.'

Epidemic (ep-i-dem'ik), or EPIDEMIC DISEASE (Gr. *epi*, upon, and *demos*, people) signifies a disease which attacks a people, suddenly spreading from one to the other in all directions, prevailing a certain time and then dying away. It usually travels from place to place in the direction of the most frequented lines of communication. The reason is that such diseases are commonly due to some infective material capable of being conveyed from one individual to another, and of being transported from place to place. Among these diseases are smallpox, cholera, scarlet fever, measles, chicken-pox, diphtheria, typhoid fever, yellow fever, etc. Certain diseases which appear to be more mental than physical sometimes occur so numerously as to assume an epidemic form, such as St. Vitus' dance, convulsionary diseases, suicidal mania, etc. (See *Endemic*.)

Epidendrum (ep-i-den'drum; Gr. *epi*, upon, and *dendron*, a tree), a large genus of tropical American orchids, most of the species of which are epiphytic, growing on trees. There are upwards of 300 species. The stems are often pseudo-bulbs, the leaves are strap-shaped and leathery, and the flowers are single or in spikes, panicles or racemes. The flowers are very handsome, and a large number of the species are in cultivation.

Epidermis (ep-i-der'mis), in anatomy, the cuticle or scarf-skin of the body; a thin membrane covering the true skin of animals, consisting of two layers, an inner or mucous layer, called the *rete mucosum*, composed of active cells containing granules of coloring matter, and an outer or horny layer, consisting of flattened scale-like cells, dry, inactive and effete, which are constantly being shed in the form of dust. Both layers are destitute of feeling, and of vessels or nerves.—The term is also applied to the cellular layer which covers the surface of plants, usually formed of a layer or layers of more or less compressed and flattened cells. It may be thin and soft or dense and hard, and has often appendages in the form of hairs, glands, etc.

Epidote (e p'i-d ō t), a mineral of a green or gray color, vitreous luster, and partial transparency, a member of the garnet family. The primary form of the crystals is a right rhomboidal prism.

Epigæa (ep-i-jē'a), a genus of shrubs of the heath order, characterized by having three leaflets on outside of the five-parted calyx; and the corolla being salver-shaped, f clef with its tube hairy on the ins *E. repens*, the trailing arbutus, is May-flower of North America.

Epigastrium (ep-i-gas'tri-um), GASTRIC REGION *epi*, upon; *gastēr*, the stomach), t part of the abdomen that lies over stomach. (See *Abdomen*.)

Epigenesis (ep-i-jen'e-sis), a techni term for the concept of the development of an organism the division or segmentation of a sin germ or egg cell. It was preceded by idea that a miniature copy of the org ism existed in the germ and nee growth only.

Epiglottis (ep-i-glot'is), a carti inous plate behind tongue, which covers the glottis lik lid during the act of swallowing, thus prevents foreign bodies from en ing the larynx. In its ordinary posit during respiration it is pointed upwa but in the act of swallowing it is pres downwards and backwards by the dr ing up of the windpipe beneath the b of the tongue, and thus closes the trance to the air-passages. (See *Laryn*

Epigram (ep'i-gram; Gr. *epi*, up *graphein*, to write), i restricted sense, a short poem or p in verse, which has only one subject, finishes by a witty or ingenious turn thought; in a general sense, a pointed witty and antithetical saying. The t was originally given by the Greeks t poetical inscription placed upon a t or public monument, and was afterwa extended to every little piece of v expressing with precision a delicate ingenious thought, as the pieces in Greek anthology. In Roman class poetry the term was somewhat in criminately used, but the epigrams Martial contain a great number v the modern epigrammatic character.

Epigynous (e-p i j'i-nus), in bots growing on the top of ovary or appearing to do so; said of mens and petals.

Epilepsy (ep'i-lep-si; Greek, *epilē* literally, a seizure), a n ous disease, the falling-sickness, so ca because the patient falls suddenly to ground. It depends on various cau often exceedingly complicated and in able of being removed; hence it is o an incurable periodical disease, app ing in single paroxysms. In its f developed form, convulsions, attended complete unconsciousness, form the pr

inent feature. Among the different causes may be mentioned hereditary tendency, gastric disturbances, or some irritation within the skull itself, such as tumors, etc. It is, for the most part, preceded by a tingling sensation, creeping up from the foot or hand to the breast and head, or some other premonitory symptom such as spectral illusions, headache, giddiness, confusion of thought, sense of fear, etc.; but sometimes there are no precursive symptoms. During the paroxysm all that is to be attended to is to prevent the patient from injuring himself; and this is to be accomplished by raising the head gently and loosening all tight parts of the dress. It is advisable to protect the tongue from being bitten by introducing a piece of India rubber, cork or soft wood between the teeth.

Epilobium (ep-i-lō'bi-um), the willow herbs, a genus of plants, nat. order Onagraceæ. The species are herbs or undershrubs, with pink or purple, rarely yellow, flowers, solitary in the axils of the leaves or in terminal leafy spikes. The seeds are tipped with a pencil of silky hairs, and are contained in a long, four-celled capsule. There are more than fifty species scattered over the Arctic and temperate regions of the world, ten of them being natives of Britain.

Epilogue (ep'i-log; Greek *epi*, upon, and *logos*, word, speech), the closing speech or short poem addressed to the audience at the end of a play. The epilogue is the opposite of the *prologue*, or opening address.

Epimachus (e-pim'a-kus), a genus of slender-billed (tenuirostral) birds of the hoopoe family, resembling the birds of paradise in the exceeding luxuriance and brilliancy of their plumage.

Epimenides (ep-i-men'i-dez), an ancient Greek philosopher and poet, born in Crete in the seventh century before Christ. He was held for an infallible prophet, and by some is reckoned among the seven wise men, instead of Periander. He is supposed to be the prophet referred to by St. Paul in Titus, i, 12.

Epimetheus (ep-i-mē'thūs), in Greek mythology, the brother of Prometheus and husband of Pandora. Epimetheus may be translated 'afterthought,' as Prometheus 'forethought.'

Epinal (ā-pē-nal), a town of Eastern France, capital of the department of the Vosges, on the Moselle. It is well built and has handsome quays, an ancient Gothic church, a communal college, a public library, a museum, etc. The manufactures consist of articles in iron and brass, cutlery, earthenware, leather, oil and chemicals. The famous paper-mills of Archettes are in the vicinity. Pop. (1906) 21,296.

Epinay (ā-pē-nā), LOUISE FLORENCE PÉTRONILLE, MADAME D', a French authoress, born in 1725; died in 1783. She became the wife of M. Delalive d'Épinay. In 1748 she became acquainted with Rousseau, and gave him a cottage in which he passed much time. She left interesting memoirs.

Epiphanius (e-pi-fā'ni-us), ST., was born in Palestine about 130; died in 403. About 367 he was consecrated Bishop of Salamis or Constantia, in Cyprus. His work *Panarion* gives the history, together with the refutation, of a great number of heresies. His festival is on the 12th of May.

Epiphany (e-pif'e-ni; Greek, *epiphaneia*, a manifestation or showing forth), a festival, otherwise called the *manifestations of Christ to the Gentiles*, observed on the 6th of January in honor of the adoration of the three magi, or wisemen. As a separate festival it dates from 813.

Epiphyte (ep'i-fīt; Greek, *epi*, on; *phyton*, a plant), a plant which grows and flourishes on the trunks and branches of trees, adhering to the bark, as a moss, lichen, fern, etc., but which does not like a parasite derive any nourishment from the plant on which it grows. Many orchidaceous plants are epiphytes.

Epiphytic (ep'i-fit-ik), the term applied to the spread of contagious diseases among plants. Contagion is as common in the vegetable kingdom as in the animal (see *Epidemic, Epizoötic*) and is responsible for enormous losses of wealth. A well-known botanist has estimated that the annual loss of crops from plant diseases throughout the world varies from $750,000,000 to $1,000,000,000. The idea of an international fight against epiphytics was formulated for the first time in 1891, at the International Congress of Agriculture at the Hague. An international commission for studying plant maladies, formed at Rome in 1903, has its seat at Berlin.

Epirus (e-pī'rus; Greek, *Ēpeiros*), a country of ancient Greece corresponding to the southern portion of Albania. The inhabitants were only in part Greeks. Epirus became a Roman province in B.C. 168, and shared the fortunes of Rome till conquered by the Turks.

Episcopacy (e-pis'ku-pā-si), the system of church govern-

ment in which bishops are established as distinct from and superior to priests or presbyters, there being in the church three distinct orders—deacons, priests and bishops. See *Bishop*.

Episode (ep'i-sōd; Greek, *epeisodion*, something adventitious), an incidental narrative, or digression in a poem, which the poet has connected with the main plot, but which is not essential to it.

Epistaxis (e-pi-staks'is), in medicine, a name for bleeding from within the nose.

Epistemology (e-pis-te-mol'ō-ji; Greek, *epistēmē*, knowledge), that department of metaphysics which investigates and explains the doctrine or theory of knowing; distinguished from *ontology*, which investigates real existence or the theory of being.

Epistolæ Obscurorum Virorum ('Letters of Obscure Men') is the title of a collection of satirical letters which appeared in Germany in 1515-17, and professed to be the composition of certain ecclesiastics and professors in Cologne and other places. It is considered as one of the most masterly sarcasms in the history of literature, and its importance is enhanced by the effect it had in promoting the cause of the Reformation. The authorship of this satire has been a fertile subject of controversy, and is yet apparently far from being settled.

Epitaph (ep'i-taf; Greek, *epi*, upon, and *taphos*, tomb), an inscription upon a tomb or monument in honor or memory of the dead. Epitaphs were in use both among the Greeks and Romans. The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded upon tombstones. The same practice has generally prevailed in Christian countries. On Christian tombstones epitaphs usually give brief facts of the deceased's life, sometimes also the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, etc. Many so-called epitaphs are mere witty *jeux d'esprit*, which might be described as epigrams, and which were never intended seriously for monumental inscriptions. The literature of the subject is very large.

Epithalamium (e-pi-tha-lā'mi-um; Gr. *epi*, on, and *thalamos*, a chamber, a nuptial song or poem in praise of a bride and bridegroom. Among the Greeks and Romans it was sung by young men and maids at the door of the bridal chamber of a new-married couple. Sappho, Anacreon, Pindar, Catullus and other Greek and Roman authors composed poems of this type. The finest example extant is Spenser's ardent *Epithalamion*.

Epithelioma (ep-i-the-li-ō'ma), epithelial cancer. See *Cancer*.

Epithelium (e-pi-the'li-um), in anatomy, the cellular layer which covers the body and the one which lines the internal cavities and canals of the body, as the mouth, nose, respiratory organs, alimentary canal, etc. There are several varieties of epithelium. The lining of the blood-vessels and all other closed cavities are called *endothelium*.

Epizoa (e-pi-zō'a), a term applied to those parasitic animals which live upon the bodies of other animals, as lice, the itch-insect, etc.

Epizoötic (e-pi-zō-ōt'ik), or Epizoötic Disease, a disease that at some particular time and place attacks great number of the lower animals just as an epidemic attacks man. Pleuropneumonia is often an epizoötic, as was also the rinderpest.

Epoch (ē'pok, ep'ok), or Era, is a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. The creation has formed the foundation of various chronologies, the chief of which are: 1. The epoch adopted by Bossuet, Ussher and other Catholic and Protestant divines, which places the creation in B.C. 4004. 2. The *Era of Constantinople* (adopted by Russia), which places it in B.C. 5508. 3. The *Era of Antioch*, used till A.D. 284, placed the creation B.C. 5502. 4. The *Era of Alexandria*, which made the creation B.C. 5492. This is also the *Abyssinian Era*. 5. The *Jewish Era*, which places the creation in B.C. 3760. The Greeks computed their time by periods of four years, called *Olympiads*, from the occurrence every fourth year of the Olympic games. The first Olympiad, being the year in which Corœbus was victor in the Olympic games, was in the year B.C. 776. The Romans dated from the supposed era of the foundation of their city (Ab Urbe Condita, A. U. C.), the 21st of April, in the third year of the sixth Olympiad, or B.C. 753 (according to some authorities, B.C. 752). The *Christian Era*, or mode of computing

from the birth of Christ as a starting-point, was first introduced in the sixth century, and was generally adopted by the year 1000. This event is believed to have taken place earlier, perhaps by four years, than the received date. The *Julian epoch*, based on the coincidence of the solar, lunar and indictional periods, is fixed at 4713 B.C., and is the only epoch established on an astronomical basis. The *Mohammedan Era*, or *Hejira*, commenced on July 16, 622, and the years are computed by lunar months. The Chinese reckon their time by cycles of 60 years. Instead of numbering them as we do, they give a different name to every year in the cycle. See *Chronology, Calendar.*

Epping (ep'ing), a village of England, in Essex, 17 miles from London, in the midst of an ancient royal forest which one time covered nearly the whole of Essex. The unenclosed portion has lately been secured by the public as a free place of recreation.

Eprouvette (ep-rö-vet'), the name of an instrument for ascertaining the strength of gunpowder, or for comparing the strength of different kinds of gunpowder.

Epsom (ep'som), a town in the county of Surrey, England, 15 miles S. W. of London, formerly celebrated for a mineral spring, from the water of which the well-known Epsom salts were manufactured. The principal attraction Epsom can now boast of is the grand race meeting held on the Downs, the chief races being the Derby and Oaks (which see). Pop. (1911) 19,156.

Epsom Salt, sulphate of magnesium ($MgSO_4.7H_2O$), a cathartic salt which appears in capillary fibers or acicular crystals. It is found covering crevices of rocks, in mineral springs, etc.; but is commonly prepared by artificial processes from magnesian limestone by treatng it with sulphuric acid, or by dissolving the mineral *kieserite* ($MgSO_4H_2O$) in boiling water, allowing the insoluble matter to settle, and crystallizing out the Epsom salt from the clear solution. It is employed in medicine as a purgative, and in the arts. The name is derived from its having been first procured from the mineral waters at Epsom.

Epworth (ep'wurth), a small town of N. Lincolnshire, 9 miles N. of Gainsborough, the birthplace of John Wesley, the founder of Methodism. Pop. 3746.

Epworth League, a society founded at Cleveland, Ohio, in 1889, among the young members of the Methodist Episcopal Church, as a successor to the Young Peoples' Methodist Alliance of 1883. Its purpose was 'to attain and help others to attain the highest New Testament standard of experience and life.' The society grew rapidly and has been of much service to the Church. It now claims to be the largest denominational society of young people in the world, having chapters in many foreign lands.

Equation (ē-kwā'shun), in algebra, a proposition asserting the equality of two quantities, and expressed by the sign = between them; or an expression of the same quantity in two dissimilar terms, but of equal value; as, $3s. = 36d.$ or $x = b + m - r$. In the latter case x is equal to b added to m, with r subtracted, and the quantities on the right hand of the sign of equation are said to be the value of x on the left hand. An equation is termed *simple*, *quadratic*, *cubic* or *biquadratic*, or of the first, second, third or fourth degree, according as the index of the highest power of the unknown quantity is one, two, three or four.

Equation, in astronomy, the correction or quantity to be added to or subtracted from the mean position of a heavenly body to obtain the true position. The term *personal equation* is the quantity of time by which a person is in the habit of noting a phenomenon wrongly; it may be called positive or negative, according as he notes it after or before it really takes place.

Equation of Payments, an arithmetical rule for the purpose of ascertaining at what time it is equitable that a person should make payment of a whole debt which is due in different parts, payable at different times.

Equation of Time, the difference between mean and apparent time, or the difference of time as given by a clock and as given by a sun-dial, arising chiefly from the varying velocity of the earth in its orbit and the eccentricity of the orbit. The sun and the clock agree four times in the year; the greatest difference between them at the beginning of November is fully sixteen minutes. See *Day.*

Equator (ē-kwā'tûr), that great circle of our globe every point of which is 90° from the poles. All places which are on it have invariably equal days and nights. Our earth is divided by it into the northern and southern hemispheres. From this circle is reckoned the latitude of places both north and south. There is also a correspond-

ing celestial equator in the plane of the terrestrial, an imaginary great circle in the heavens the plane of which is perpendicular to the axis of the earth. It is everywhere 90° distant from the celestial poles, which coincide with the extremities of the earth's axis, supposed to be projected to meet the heavens. During his apparent yearly course the sun is twice in the celestial, and vertically over the terrestrial equator, at the beginning of spring and of autumn. Then the day and night are equal all over the earth, whence the name *equinox*. —The *magnetic equator* is a line which pretty nearly coincides with the geographical equator, and at every point of which the vertical component of the earth's magnetic attraction is zero; that is to say, a dipping needle carried along the magnetic equator remains horizontal. It is hence also called the *aclinic line*.

Equatorial (ē-kwa-tō'ri-al), an astronomical instrument contrived for the purpose of directing a telescope upon any celestial object, and of keeping the object in view for any length of time, notwithstanding the diurnal motion of the earth. For these purposes a principal axis resting on firm supports is mounted exactly parallel to the axis of the earth's rotation, and consequently pointing to the poles of the heavens, being fixed so as to turn on pivots at its extremities. To this there is attached a telescope moving on an axis of its own in such a way that it may either be exactly parallel to the other axis, or at any angle to it; when at right angles it points to the celestial equator. By this means a star can be followed by one motion from its rising to its setting. In some observatories the equatorials have the necessary motion given them by clockwork.

Equerry (ek'we-ri, ē-kwe'ri), in Britain, the name of certain officers of the royal household, in the department of the master of the horse, whose duties consist in attendance when the sovereign rides abroad. Officers with the same denomination form part of the establishments of the members of the royal family.

Equestrian Order (e-kwes'tri-an), the order of 'Knights' existing in ancient Rome. The *equites* or knights originally formed the cavalry of the army. They are said by Livy to have been instituted by Romulus, who selected 300 of them from the three principal tribes. About the time of the Gracchi (123 B.C.) the equites became a distinct order in the state, and the judges and the farmers of the revenue were selected from their ranks. They held their position in virtue of a certain property qualification, and towards the end of the republic they possessed much influence in the state. They had particular seats assigned to them in the circus and theater, and the insignia of their rank, in addition to a horse, were a gold ring and a robe with a narrow purple border. Under the later emperors the order disappeared from the stage of political life.

Equidæ (ē'kwi-dē), the horse family, a family of animals belonging to the order Ungulata, or hoofed mammals, and subdivision Perissodactyla, characterized by an undivided hoof formed of the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth on each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the males, and sometimes in both jaws. It is divided into two groups—one including the asses and zebras, the other comprising the true horses (genus *Equus*).

Equilibrium (e-kwi-lib'ri-um), a state of equipoise; a state of rest produced by the mutual counteraction of two or more forces, as the state of the two ends of a lever or balance, when both are charged with equal weight. When a body, being slightly moved out of any position, always tends to return to its position, that position is said to be one of *stable equilibrium;* when the body will not thus return to its previous position, its position is said to be one of *unstable equilibrium*.

Equinoctial (e-kwi-nok'shal), in astronomy, the circle in the heavens otherwise known as the celestial equator. When the sun is on the equator there is equal length of day and night over all the earth; hence the name *equinoctial*.—*Equinoctial gales*, storms which are observed generally to take place about the time of the sun's crossing the equator, that is, at the vernal and autumnal equinox, in March and September. (See *Equinox*.)—*Equinoctial points* are the two points wherein the celestial equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the *vernal point;* and the other, in the first point of Libra, the *autumnal point*. These points are found to be moving backward or westward at the rate of 50″ of a degree in a year. This is called the precession of the equinoxes. See *Precession*.

Equinox (ē'kwi-noks), the precise time when the sun enters one of the equinoctial points, or the first

point of Aries about the 21st of March, and the first point of Libra about the 23d of September, making the day and night of equal length all over the world. At all other times the lengths of the day and the night are unequal, their difference being the greater the more we approach either pole, while in the same latitude it is everywhere the same. See *Equinoctial*.

Equisetum (e-kwi-sē'tum), a genus of ascular cryptogamous plants with hollow-jointed stems, type of a nat. order, the Equisetaceæ, growing in wet places, and popularly called *horse-tails*. See *Horse-tail*.

Equites (ek'wi-tēz). See *Equestrian Order*.

Equity (ek'wi-ti), in law, the system of supplemental law administered in certain courts, founded upon defined rules, recorded precedents, and established principles, the judges, however, liberally expounding and developing them to meet new exigencies. While it aims to assist the defects of the common law, by extending relief to those rights of property which the strict law does not recognize, and by giving more ample and distributive redress than the ordinary tribunals afford, equity by no means either controls, mitigates or supersedes the common law, but rather guides itself by its analogies, and does not assume any power to subvert its doctrines. Courts of equity grant redress to all parties where they have rights, *ex æquo et bono*, and modify and fashion that redress according to circumstances. They bring before them all the parties interested in the subject matter of the suit, and adjust the rights of all.

Equity of Redemption, in law, the advantage allowed to a mortgager of a reasonable time to redeem an estate mortgaged, when it is of greater value than the sum for which it is mortgaged.

Equivalents (e-kwiv'a-lents), in chemistry, a term for the proportions in which the elements combine with one another to form compounds. See *Chemistry*.

Era (ē'ra). See *Epoch*.

Era of Good Feeling, the period from 1817 to 1824 when the Democratic-Republican was virtually the only party in the United States. President Monroe was reëlected in 1821 by 231 electoral votes out of 232 and some writers restrict the term to his second administration. One elector voted against him on the plea that Washington's record of an unanimous election should not be equaled. Internal improvements and tariff questions broke up the harmony after 1824.

Erard (ā-rär), Sebastien, a celebrated musical instrument maker, born at Strasburg in 1752; died in 1831. He went to Paris at the age of eighteen, and in concert with his brother, Jean Baptiste, produced pianofortes superior to any that had previously been made in France. He afterwards established a manufactory in London, and made considerable improvements in the mechanism of the harp.

Erasistratus (e-ra-sis't r a-t u s), an ancient Greek physician, said to have been grandson of Aristotle. He lived in the third century before the Christian era, and was court physician of Seleucus Nicator, king of Syria. He was the first who systematically dissected the human body, and his description of the brain and nerves is much more exact than any given by his predecessors. He classified the nerves into nerves of sensation and of locomotion, and it is said had almost stumbled upon the discovery of the circulation of the blood. Of his works only the titles and some fragments remain.

Erasmus (e-raz'mus), Desiderius, a Dutch scholar, born at Rotterdam in 1467. His original name was

Desiderius Erasmus

Gerard, but this he changed according to a fashion of the time. After the death of his parents, whom he lost in his fourteenth year, his guardians compelled him to enter a monastery; and at the age of seventeen he assumed the

monastic habit. The Bishop of Cambray delivered him from this constraint. In 1492 he traveled to Paris to perfect himself in theology and polite literature. He there became the instructor of several rich Englishmen, from one of whom —Lord Mountjoy—he received a pension for life. He accompanied them to England in 1497, where he was graciously received by the king. He returned soon after to the continent, took his doctor's degree, was relieved from his monastic vows by dispensation from the pope, and published several of his works. He returned to England in 1510; wrote his *Praise of Folly* while residing with Sir Thomas More, and was appointed Margaret professor of divinity and Greek lecturer at Cambridge. In 1514 he returned to the continent and lived chiefly at Basel, where he died in 1536. To extensive learning Erasmus joined a refined taste and a delicate wit. He rendered great and lasting service to the cause of reviving scholarship. Although he took no direct part in the Reformation, and was reproached by Luther for lukewarmness, he attacked the supposed disorders of monasticism and superstition, and advocated a moderate course. He edited various classics, the first edition of the Greek Testament from MSS. (with Latin translation), etc., but his best-known books are the *Encomium Moriæ*, or *Praise of Folly*, and his *Colloquies*. His letters are very valuable in reference to the history of that period.

Erastianism (e-ras'ti-an-izm), the opinions of Erastus (which see).

Erastus (e-ras'tus), the learned name of Thomas Lieber, a Swiss physician, who maintained the opinions from which the well-known epithet of *Erastian*, as now used, is derived. He was born at Baden in 1523, and died at Basel in 1584. He was successively professor of medicine at Heidelberg, and of ethics at Basel. He maintained in his writings the complete subordination of the ecclesiastical to the secular power, declaring that the church had no right to exclude any one from church ordinances, or to inflict excommunication.

Erato (er'a-tō), in Greek mythology, one of the Muses, whose name signifies loving or lovely. She presided over lyric and especially amatory poetry, and is generally represented crowned with roses and myrtle, and with the lyre in the left hand and the plectrum in the right, in the act of playing.

Eratosthenes (e-ra-tos'the-nēs), an ancient Greek astronomer, born at Cyrene, in Africa, in B.C. 276; was librarian at Alexandria, and gained his greatest renown by his investigations of the size of the earth. He rendered much service to the science of astronomy, and first observed the obliquity of the ecliptic. Of the writings attributed to him, one only remains complete—*Katasterismoi*—which treats of the constellations. He died about B.C. 194.

Erbium (er'bi-um), a rare metal found along with yttrium, terbium, and other rare elements, in some rare minerals. Its properties are but little known.

Ercilla y Zuniga (er-thil'ya ē thō-nyē'gä), Don Alonso de, a Spanish soldier and poet, born in 1533; died in 1595. He became page to the Infant Don Philip, accompanied him on his travels, and in 1554 went with him to England on the occasion of his marriage with Queen Mary. After this he fought against the Araucanians of South America (Chile), and his epic *La Araucana* is based in the events of this war. It was first published in 1569, is written in excellent Spanish, and occupies an honorable position in the national literature.

Erckmann-Chatrian (erk-mon shât-ri-äṅ), the joint name of two French-Alsatian writers of fiction. Émile Erckmann, born at Pfalzburg in 1822, studied law at Paris. Alexander Chatrian, born at Soldatenthal, near Pfalzburg, 1826, was for some time teacher in the Pfalzburg College. They formed a literary partnership in 1847, but it was not till the appearance of *L'Illustre Docteur Mathéus*, in 1859, that success attended them. Among their most popular books are *L'Ami Fritz*, *Le Fou Yégof*, *Madame Thérèse*, *Histoire d'un Conscrit de 1813*, *L'Histoire d'un Paysan*, *Waterloo*, *Le Plébiscite*, etc. Chatrian died September 4, 1890, and Erckmann in 1899.

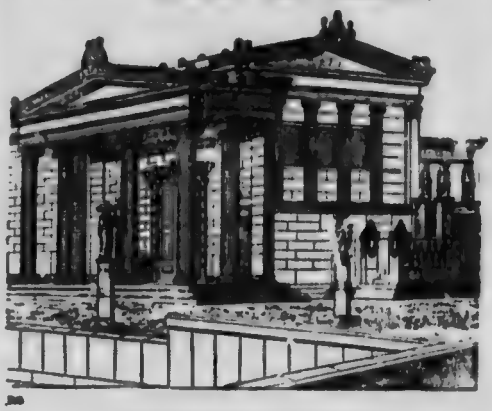
Erebus (er'e-bus), in the Greek mythology, the son of Chaos and Darkness. The name Erebus was also given to the infernal regions.

Erebus, Mount, a volcano of the Antarctic regions, in S. Victoria Land; height, 12,400 feet.

Erechtheus (e-rek'thūs), in Greek mythology, a personage associated with the early history of Athens, and to whom a fine temple, the *Erechtheum*, was built on the Acropolis.

Eregli (er-e-glē'), Erekli, the ancient *Heracleia*, a seaport of Asia Minor, on the Black Sea, province of Kastamuni, 128 miles E. N. E. of Constantinople. Pop. 6000.

Eremite (er'e-mit), a hermit or Anchorite. See *Anchorite*.



The Erechtheum (restored).

Erfurt (er'fört), an important town in the Prussian province of Saxony, on the river Gera, formerly a fortress with two citadels, now given up as such. It has a fine cathedral dating from the thirteenth century and several handsome Gothic churches. The university, founded in 1378 and suppressed in 1816, was long an important institution. There is still a royal academy of science and a royal library with 60,000 vols. The monastery (now an orphanage) was the residence of Luther from 1501 to 1508. The town is in a very flourishing condition, and rapidly extending. The industries are varied, including clothing, machinery, leather, shoes, ironmongery, chemicals, etc. The horticulture of the environs enjoys a high reputation, plants and seed being produced for sale in great quantities. Pop. (1910) 111,461.

Ergot (er'gut), the altered seed of rye and other grasses caused by the attack of a fungus called *Claviceps purpurea*. The seed is replaced by a dense, homogeneous tissue largely charged with an oily fluid. In its perfect state this germinates and produces the *Claviceps*. When diseased rye of this kind is eaten in food for some time it may cause death by a kind of mortification called dry gangrene. Ergot is used in obstetric practice to promote the contraction of the uterus after childbirth.

1, Heads of Ergot(*aa*) produced on a grass. 2, *Claviceps purpurea* (*bb*) springing from the Ergot.

Erica (e-ri'ka), the heath, a large genus of branched rigid shrubs, type of the nat. order Ericaceæ, most of which are natives of South Africa, a few being found in Europe and Asia. The leaves are narrow and rigid, the flowers are globose or tubular, and four-lobed. Five species are found in Britain. See *Heath*.

Ericaceæ (e-ri-kā'-se-ē), a nat. order of exogenous plants. See *Erica*.

Erica herbacea.

Ericht (er'-ikt), Loch, a Scottish loch amid the Grampian Mountains, on the borders of Perth and Inverness shires. It is 14½ miles long by about one mile broad, and joins Loch Rannoch by one outlet.

Ericson, Leif, or Leif the Lucky, a Norse explorer, who, about the year 1000 set out to find the country which had been previously sighted to the west, landed at several places, and wintered at one, which he called Vinland. (See *Vinland*.) The facts of this voyage are recorded in the Icelandic sagas.

Ericsson (er'iks-son), John, engineer, born in Sweden in 1803; died in 1889. He is identified with numerous inventions and improvements on steam machinery and its applications. His chief inventions are his caloric engine, the screw propeller and his turret-ships, the first of which, the *Monitor*, distinguished itself in the American Civil war, and inaugurated a new era in naval warfare. He also invented the steam fire-engine, a torpedo boat, and a solar engine.

Erie (ē'ri), one of the great chain of North American lakes, between Lakes Huron and Ontario, about 265 miles long, 63½ miles broad at its center, from 40 to 60 fathoms deep at the deepest part; area 9600 square miles. The whole of its southern shore is within the territory of the United States, and its northern within that of Canada. It receives the waters of the upper lakes by Detroit River at its southwestern extremity, and discharges its waters into Lake Ontario by the Niagara River at its northeast end. The Welland Canal enables vessels to pass from it to Lake Ontario. It is

shallow compared with the other lakes of the series and is subject to violent storms. The principal harbors are those on the United States side—Buffalo, Erie, Cleveland, etc.

Erie, county seat of Erie County, State of Pennsylvania, an important railway and lake commercial center on the southern shore of Lake Erie. Only port of Pennsylvania on the Great Lakes. There are many industries, including iron-works for boilers, engines and electrical machinery, with foundries, rolling-mills and blast furnaces, petroleum refineries, breweries, tanneries wood-working factories, brass, aluminum and sheet-metal plants, silk, woolen and paper mills. Presque Isle Bay with peninsula and adjoining parks, affords natural harbor and summer resort. There are extensive fresh water fisheries. Commerce exceeds $100,000,000 in value annually. The chief articles of export are coal, oil, iron and manufactured goods. Pop. 76,380.

Erie Canal, the largest canal in the United States, serving to connect the Great Lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany It is 363 miles long; has in all 72 locks; a surface width of 70 feet, bottom width of 42 feet, and depth of 7 feet. It is carried over several large streams on stone aqueducts; cost nearly $10,000,000, and was opened in 1825. The navigation is free. It is under contract to deepen and widen it, and thus adapt it to larger vessels. As thus dealt with it will be 125 feet wide at top. 75 feet at bottom, and 12 feet deep, cost exceeding $100,000,000.

Erigena (er-ij'i-na), JOANNES SCOTUS, an eminent scholar and metaphysician, probably born in Ireland about 800-810; died in France about 875. He spent a great part of his life at the court of Charles the Bald of France. His treatise on *Predestination and Free-will*, and another, *De Divisione Naturæ*, containing many unorthodox views, were condemned by the councils of Valencia in 855 and of Longres in 859, and Pope Nicholas I demanded the immediate disgrace of the culprit. His subsequent history is not known.

Erigeron (er-ij'ē-ron), a genus of humble composite plants, of which *E. Canadense* of America has diuretic properties.

Erinaceus (e-ri-nā'se-us). a genus of animals, of which the hedgehog is the type. See *Hedgehog.*

Erinna (e-rin'na), a Greek poetess who lives about 600 B.C. She is said to have been an intimate friend of Sappho, and died at the age of eighteen. She acquired a high reputation for poetry; her chief work was called *Elakatē* ('The Distaff'), of which nothing has come down to us. An epitaph or two which are still extant, and believed by some to be hers, are by others deemed spurious.

Erinnyes (e-rin'i-ēz). See *Furies.*

Eriodendron (er-i-ō-den'dron), the wool tree, a genus of plants, nat. order Malvaceæ (mallows). There are eight species natives of America, but one belongs to Asia and Africa. The species are noble plants, growing from 50 to 100 feet high, having palmate leaves, and red or white flowers. The wooly coat of the seeds of some of the species is used in different countries for stuffing cushions and similar purposes.

Wool Tree (*Eriodendron anfractuosum*).

Eriometer (er-i-om'e-tèr; Greek, *erion*, wool; *metron*, a measure), an optical instrument for measuring the diameters of minute particles and fibers, from the size of the colored rings produced by the diffraction of the light in which the objects are viewed.

Eriophorum (er-i-o f'o-r u m). See *Cotton-grass.*

Eris (e'ris), in the Greek mythology, the goddess of discord. Not being invited to the marriage of Peleus, she revenged herself by means of the *apple of discord.* See *Paris.*

Erith (er'ith), a town of England, in Kent, on the Thames, about 14 miles east of London, a pleasant summer resort. Pop. (1911) 27,755.

Erivan (er-ē-vän'), a Russian town, capital of a government of the same name in the lieutenancy of the Caucasus, on the Zanga, north of Mount Ararat. It has a citadel, barracks, a cannon foundry and some manufactures. Pop. 29,033. The GOVERNMENT has an area of 10,705 sq. miles, and a pop. of 909,100.

Erlangen (er'läng-en), a town of Bavaria, 10 miles N. N. W. of Nürnberg. The Protestant university, founded in 1743, is the chief institution. The industries include cotton-spinning and weaving, mirrors, hosiery, gloves, combs, etc. Pop. (1905) 23,720.

Erlau (er'lou), or **Eger**, a town of Hungary, on the Eger, 65 miles E. N. E. of Budapest. It has sundry manufactures; and the red wines of the district, esteemed the best in Hungary, are largely exported. Pop. 24,650.

Erl-king, the English form of the name given in German and Scandinavian poetical mythology to a personified natural power which devises and works mischief, especially to children. Goethe's celebrated poem *Der Erlkönig* (lit. 'elf-king') has rendered this malicious spirit universally known.

Ermine (er'min), the stoat, a quadruped of the weasel tribe (*Mustela Erminea*), found over temperate Europe and N. America, but common only in the north. In consequence of the change that occurs in the color of

Ermine (*Mustela Erminea*).

its fur at different seasons—by far most marked in the Arctic regions—it is not generally known that the ermine and stoat are the same. In winter, in cold countries or severe seasons, the fur changes from a reddish-brown to a yellowish-white, or almost pure white, under which shade the animal is recognized as the ermine. In both states the tip of the tail is black. Like many other species of this genus the ermine has the faculty of ejecting a fluid of a musky odor. Its fur is short, soft and silky; the best skins being brought from Russia Sweden and Norway and Hudson Bay territories. Its fur was formerly one of the insignia of royalty, and is still used by judges. When used as linings of cloaks the black tuft from the tail is sewed to the skin at irregular distances.—In heraldry, ermine is one of the furs, represented with its peculiar black spots on a white ground.

Ermine.

Erne (ern), the name often given to all the eagles of the genus *Haliaëtus*, but more specifically to the white-tailed sea eagle. See *Sea Eagle*.

Erne (ern), **Lough**, a lake of Ireland, County Fermanagh, consisting of a north or lower, and a south or upper lake (with the town of Enniskillen between), connected by a narrow winding channel, and properly forming only expansions of the river Erne. Its entire length is about 40 miles; average breadth 6 miles. It contains numerous small islands, and is well stocked with fish.—The River Erne rises in Lough Gounagh, in the County of Longford, flows through Loughs Oughter and Erne and falls into Donegal Bay below Ballyshannon. It is 72 miles long.

Ernest Augustus (ern'est a'gus-tus), King of Hanover and Duke of Cumberland, was the fifth son of George III; born in 1771; died in 1851. He became a field marshal in the British army, and on the death of William IV, in 1837, he ascended the throne of Hanover, in consequence of the succession to the sovereignty of that country being limited to male heirs. He was succeeded by his son, George V, the last of the Hanoverian kings.

Eros (ē'ros), the Greek name of Cupid and Amor. This name has also been given to a recently discovered planetoid, which is remarkable from the fact that its orbit, in its nearest approach to the earth, comes within that of Mars. It is thus the nearest to the earth of all celestial bodies except the moon. This fact renders it of great value in the study of the solar parallax, and it has been used for this purpose.

Erosion Theory (e-rō'zhun), in geology, the theory, now held by all geologists, that valleys are due to the wearing influences of water and ice, the latter chiefly in the form of glaciers, as opposed to the theory which regards them as the result of fissures in earth's crust produced by strains during it upheavel.

Erotic (e-rot'ik; from the Gr. *erōs*, love), relating to love.—*Erotic Poetry*, amatory poetry.—The name of *erotic* writers has been applied, in Greek literature, particularly to a class of romance writers, and to the writer of the *Milesian Tales*.

Erotomania (er-ō-to-mā'ni-a), mental alienation or melancholy caused by love.

Errata (e-ra'ta; Lat. the plural form of *erratum*, an error), the list of errors and corrections placed at the end or at the beginning of a book.

Erratics (e-rat'iks), or **Erratic Blocks**, in geology, boulders or large masses of angular rock which have been transported to a distance from their original mountains by the action of ice during the glacial period. Thus, on

the slopes of the Jura Mountains immense blocks of granite are found which have traveled 60 miles from their original situation. Similarly masses of Scotch and Lake district granites and of Welsh rocks (some of which weigh several tons) occur not uncommonly in the surface soil of the Midland counties of England.

Ersch (ersh), JOHN SAMUEL, a German bibliographer, born in 1766; died in 1828. He was principal librarian and professor of geography and statistics at Halle. Among his publications are a *Dictionary of French Writers*; a *Manual of German Literature*; and, in connection with Gruber, the *Universal Encyclopedia of Arts and Sciences* (Leipzig, 1818, et seq., 4to).

Erse (ers), a name sometimes given to Gaelic.

Erskine (ers'kin), EBENEZER, the founder of the Secession Church in Scotland, born in 1680; died in 1756. He studied at Edinburgh, and was ordained minister of Portmoak, in Fife, in 1703, in which situation he continued for twenty-eight years, when he removed to Stirling. His attitude towards patronage and other abuses in the church led to his being deposed, when, in conjunction with his brother and others, he founded the Secession Church. He is the author of several volumes of sermons.

Erskine, HENRY, a Scottish barrister, was the third son of Henry David, tenth earl of Buchan; born at Edinburgh in 1746; died in 1817. After studying at the universities of St. Andrews, Edinburgh and Glasgow, he adopted the legal profession, and in 1768 was called to the bar. He twice held the office of lord-advocate, was for long the leader of the Scottish bar, and held a high reputation as a wit.

Erskine, JOHN, of Carnock, afterwards of Cardross, Scottish jurist, born in 1695; died in 1768. He was called to the Scotch bar in 1719, and was author of *Principles of the Law of Scotland* and the *Institute of the Law of Scotland*, both works of authority.

Erskine, RALPH, brother of Ebenezer Erskine, born in 1685; died in 1752. He was ordained to the parish of Dunfermline in 1711, and in 1737 joined his brother, who had seceded from the Established Church. His *Gospel Sonnets* and other religious works were once very popular.

Erskine, THOMAS, LORD ERSKINE, a Scottish lawyer, the youngest son of the tenth Earl of Buchan, was born in 1750, and died in 1823. He was educated partly at the High School of Edinburgh, and partly at the University of St. Andrews. After serving four years in the navy and seven in the army he commenced the study of law, and in 1778 took his degree at Cambridge and was called to the bar. His success was immediate. In May, 1783, he received a silk gown and the same year was elected member of parliament for Portsmouth, a seat which he held till 1806, when he was raised to the peerage. The rights of juries he firmly maintained on all occasions, but particularly in the celebrated trial of the Dean of St. Asaph for libel. In 1789 he defended Mr. Stockdale, a bookseller, for publishing what was charged as a libelous pamphlet in favor of Warren Hastings. In 1792, being employed to defend Thomas Paine, when prosecuted for the second part of his *Rights of Man*, he declared that, waiving all personal convictions, he deemed it right, as an English advocate, to obey the call, by the maintenance of which principle he lost his office of attorney-general to the Prince of Wales. In the trials of Hardy, Tooke and others for high treason in 1794, which lasted for several weeks, the ability displayed by Erskine was acknowledged by all parties. He was a warm partisan of Fox, and a strenuous opposer of the war with France. In 1802 the Prince of Wales not only restored him to his office of attorney-general, but made him keeper of his seals for the Duchy of Cornwall. On the death of Pitt, in 1806, Erskine was created a peer, and raised to the dignity of lord-chancellor. During his short tenure of office the bill for the abolition of slavery was passed. After he retired with the usual pension he took little part in politics.

Eruptive Rocks (e-rup'tiv), in geology, those which, like lava, basalt, granite, etc., have broken through other rocks while in a molten state.

Eryngo (er-in'gō; *Eryngium*), a genus of plants belonging to the nat. order Umbelliferæ. There are upwards of 100 species found in temperate and subtropical climates, but chiefly in South America. *E. maritimum*, also called sea-holly, is a British species. It frequents sandy shores, and is distinguished by its rigid, spiny, glaucous, veined leaves, and its dense heads of blue flowers. The roots are sometimes candied, and are reputed to be stimulating and restorative, as well as to have aphrodisiac properties. *E. campestre* was formerly much employed in Europe as a tonic, and as tending to promote appetite.

E. aquaticum is an American species known by the name of rattlesnake weed.

Erysimum (e-ris'i-mum), a genus of plants nat. order Cruciferæ, chiefly biennials, with narrow entire leaves, and yellow, often fragrant, flowers. There are about 100 species, natives of northern temperate and cold countries. *E. cheiranthoides*, a native of Europe and North America, is found in waste places, and from being used as an anthelmintic, is called wormseed.

Erysipelas (er-i-sip'e-lus), the rose, or St. Anthony's fire, a disease characterized by diffused inflammation of the skin of some part of the body, but chiefly of the face or head, and attended by fever. It is, generally, an acute affection, its medium duration being from ten to fourteen days. It should be treated by nourishing food and iron tonics, the parts being protected from cold.

Erythema (er-i-thē'ma), a mild form of inflammation of the skin somewhat resembling erysipelas. Some forms are connected with constitutional diseases, as rheumatism, gout, etc.

Erythræa (er-i-thrē'a), a genus of annual herbs, of which *Centaury* is the best-known species.

Erythræa Sea (er-i-thrē'an), in ancient geography a name given to what is now called the Indian Ocean, but including the Persian and Arabian gulfs. The name was latterly restricted to the Arabian Gulf.

Erythrina (er-i-thri'na), the coral tree, a genus of trees with bright red flowers. See *Coral Tree*.

Erythronium (er-i-thrō'ni-um), a genus of liliaceous plants, natives of temperate regions, nearly stemless herbs, with two smooth, shining, flat leaves, and large generally reddish flowers, which are solitary. They have a long, narrow, solid, scaly bulb. One of them is the dog's-tooth violet.

Erythrophlœum (er-i-thro-flē'um), a genus of tropical trees, nat. order Leguminosæ, containing three species, two found in Africa and the third in Australia. The *E. guineënse* of Guinea has a poisonous juice, which is used by the natives as a test of innocence and guilt, and hence the name ordeal tree.

Erythroxyleæ (er-i-throks-i'le-ē), Erythroxylaceæ, a nat. order of exogenous plants, having alternate stipulate leaves; small, pallid flowers and drupaceous fruit. The principal genus is *Erythroxylon*, some of whose species have a bright red wood (hence the name—Gr. *erythros*, red, *xylon*, wood), occasionally used for dyeing. For *E. coca* see *Coca*.

Eryx (er'iks), an ancient city and a mountain in the west of Sicily, about 2 miles from the sea-coast. The mountain, now Monte San Giuliano, rises direct from the plain to a height of 2184 feet. On the summit anciently stood a celebrated temple of Venus. All traces of the ancient town of Eryx have now disappeared, and its site is occupied by the modern town of San Giuliano.

Erzerum, Erzeroum or Erzeroom (er'ze-röm), a city of Turkish Armenia, capital of a vilayet with an area of 27,000 sq. miles, and a pop. of 582,745. The town is about 6000 feet above sea-level, forms an important strategical center, and has become a principal frontier fortress. It is irregularly built, its narrow, dirty streets, flanked by mean houses, being crowded together in the small space enclosed by its lofty walls. The Moslem element prevails largely over the Christian, although it is the metropolis of the Armenian Church in union with Rome. In addition to important manufactures, especially in copper and iron, it carries on an extensive trade, and is a chief halting-place for Persian pilgrims on their way to Mecca. Pop. about 43,000.

Erzgebirge (erts'ge-bir-ge; 'Ore Mountains'), a chain of European mountains forming a natural boundary between Saxony and Bohemia, nearly 120 miles in length and 25 miles broad. The highest summits, which are on the side of Saxony, rise to 3800 or 3900 feet. The mountains are rich in silver, iron, copper, lead, cobalt, arsenic, etc.

Esarhaddon (es-ar-had'on), the son of Sennacherib, and one of the most powerful of all the Assyrian monarchs. He extended the empire on all sides, and is the only Assyrian monarch who actually reigned at Babylon. He died about 667 B.C. See *Assyria*.

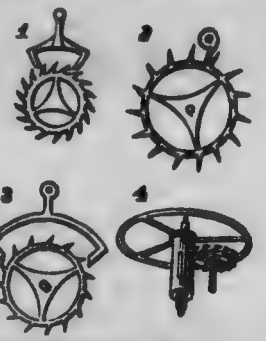
Esau (ē'sa), the eldest son of Isaac, and twin-brother of Jacob. His name (which signifies rough, hairy) was due to his singular appearance at birth, being 'red, and all over like a hairy garment.' The story of his marriage, of his loss of birthright through the craft of Rebekah and Jacob, and of his quarrel and reconciliation with Jacob are told in the book of Genesis. He was the progenitor of the Edomites, who dwelt on Mount Seir.

Escalator (es-ka-lā'tor), a moving stairway or traveling sidewalk. These are moving platforms to carry passengers from one point to an-

other, or steps to carry from one story to another. They were first tried at the Chicago Exposition of 1893, and soon became common.

Escanaba (es-ka-na'ba), a city, capital of Delta Co., Michigan, at the north end of Green Bay; has a good harbor, shipping large amounts of iron ore. Has manufactures of lumber and wooden ware, veneer plants, furnace and tannery. Pop. 15,000.

Escapement (es-kāp'ment), the general contrivance in a time-piece by which the pressure of the wheels (which move always in one direction) and the vibratory motion of the pendulum or balance-wheel are accommodated the one to the other. By this contrivance the wheelwork is made to communicate an impulse to the regulating power (which in a clock is the pendulum and in a watch the balance-wheel), so as



Watch and Clock Escapements.
1, Anchor escapement of a common clock. 2, Duplex escapement. 3, Lever escapement. 4, Horizontal or cylinder escapement.

to restore to it the small portion of force which it loses in every vibration, in consequence of friction and the resistance of the air. The leading requisite of a good escapement is that the impulse communicated to the pendulum or balance-wheel shall be invariable, notwithstanding any irregularity or foulness in the train of wheels. Various kinds of escapements have been contrived, some of which are shown in the accompanying figure. See also *Clock*, *Watch*.

Escar, Eskar (es'kar), a late geological formation in the superficial drift, generally consisting of a long, linear ridge of sand and gravel, including pieces of considerable size. The materials are derived from the waste of till or boulder-clay, and their arrangement took place probably under water over which icebergs floated, for in Sweden particularly angular, erratic blocks are often deposited on the *escar*. They are called in Scotland *Kaims* or *Kames*.

Escarp (es-kärp'), in fortification. See *Scarp*.

Eschalot (esh'a-lot). See *Shallot*.

Eschar (es'kär), a slough or portion of dead or disorganized tissue. The name is commonly applied to the crust or seal occasioned on the skin by burns or caustic applications.

Escharotics (es-ka-rot'iks), substances that cause an eschar (which see).

Eschatology (es-ka-tol'o-ji), in theology the 'doctrine respecting the last things,' which treats of the millennium, the second advent of Christ, the resurrection, judgment, conflagration of the world, and the final state of the dead.

Escheat (es-chēt'), in law, a species of reversion arising from default of heirs or by forfeiture. That which falls or lapses to the original proprietor, or to the State, as lands or other property. By modern legislation there can be no escheat or failure of the whole blood wherever there are persons of the half-blood capable of inheriting.

Eschenbach (esh'en-bäh), Wolfram von, a German mediæval poet or minnesinger, who flourished in the first half of the thirteenth century. The most esteemed of his numerous works are: *The Parzival* (printed in 1477); the *Titurel*, or the *Guardian of the Graal* (printed 1477); and the *Willehalm*, a poem on the deeds of William of Orange, a contemporary of Charlemagne.

Eschscholtzia (esh-sholt'si-a), a small genus of glabrous whitish plants, of the poppy order, natives of California and the neighboring regions. They have divided leaves and yellow, peduncled flowers. The sepals cohere and fall off as the flower opens in the form of a calyptra.

Eschwege (esh'vā-ge), a town of Prussia, province of Hessen-Nassau, on the Werra, 26 miles E. S. E. of Cassel. Pop. (1905) 11,113.

Eschweiler (esh'vī-lėr), a town of Prussia, in the province of Rheinland, 9 miles E. N. E. of Aix-la-Chapelle, on the Inde. It is the seat of large and varied manufacturing industries, especially in iron, copper and zinc, and has coal mines. Pop. 20,643.

Escobar y Mendoza (es-ko-bä'r ē men-dō'thä), Antonia, a Spanish casuist and Jesuit, born in 1589; died in 1669. His principal

works are *Summula Casuum Conscientiæ* and several scriptural commentaries. He was severely criticised by Pascal, and the extreme laxity of his moral principles was ridiculed by Boileau, Molière and La Fontaine.

Escrow (es-krō'), a legal writing delivered to a third person to be delivered by him to the person whom it purports to benefit, when some condition is performed. Upon the performance of this condition it becomes an absolute deed, but if the condition be not performed it remains an *escrow* or scroll.

Escurial (es-kū'ri-al; Spanish, *el Escorial*), a remarkable building in Spain, comprising at once a palace, a convent, a church and a mausoleum. It is distant from Madrid about 24 miles in a northwesterly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. It was built by Philip II, and dedicated to St. Lawrence, in commemoration of the victory of St. Quentin, fought on the festival of the saint in '57. It is popularly considered to be built on the plan of a gridiron, from the fact that St. Lawrence is said to have been broiled alive on a sort of large gridiron. The building is a rectangular parallelogram measuring 744 feet in length by 580 in breadth. The interior is divided into courts, formerly inhabited by monks and ecclesiastics, while a projection 460 feet in length (the handle of the gridiron) contains the royal palace. It was begun in 1563 and finished in 1584. It is of moderate height, and its innumerable windows (said to be 11,000) give it (apart from the church) somewhat the aspect of a large mill or barracks. The church is the finest portion of the whole building. The dome is 60 feet in diameter, and its height at the center is about 320 feet. Under it is the pantheon or family vault of the Spanish sovereigns. The library contains a valuable collection, including a rich store of Arabic MSS. The Escurial was partly burned in 1671, when many MSS. were destroyed, and was pillaged by the French in 1808 and 1813. It was restored by Ferdinand VII, but the monks, with their revenues which supported it, have long since disappeared. In 1872 it was fired by lightning, and suffered serious damage.

Escutcheon (es-kuch'un), in heraldry, the shield whereon coats of arms are represented. See *Heraldry*.

Esdraëlon (es-dra-ē'lon), PLAIN OF, a plain extending across Palestine from the Mediterranean to the Jordan, and drained by the river Kishon. Among its subsidiary valleys are those of Engannin, Taanach and Megiddo. This plain is celebrated for many important events in Old Testament history.

Esdras (es'dras), BOOKS OF, two apocryphal books, which, in the Vulgate and other editions, are incorporated with the canonical books of Scripture. In the Vulgate the canonical books of Ezra and Nehemiah are called the first and second, and the apocryphal books the third and fourth books of Esdras. The Geneva Bible (1560) first adopted the present nomenclature, calling the two apocryphal books first and second Esdras. The subject of the first book of Esdras is the same as that of Ezra and Nehemiah, and in general it appears to be copied from the canonical Scriptures. The second book of Esdras is supposed to have been either of much later date or to have been interpolated by Christian writers.

Esk (Celtic for water), the name of two small rivers in England—one in Cumberland and one in Yorkshire; and of several in Scotland, the chief being the Esk in Dumfriesshire; the North Esk and South Esk in Forfarshire; and the North Esk and South Esk in Edinburghshire.

Es'kar. See *Escar*.

Eski-jumna (es'kē-jum'na), a town of Bulgaria, on the northern slope of the Binar-Dagh. Pop. 8942.

Eskilstuna (ā'skil-stü-na), a town of Sweden, on river of same name connecting Lake Maelar with Lake Hjelmar, with ironworks and manufactures of steel goods, weapons, etc. Pop. 13,663.

Eskimos (es'ki-mōz). See *Esquimaux*.

Eski-Sagra (es'kē-sa'gra), a town of Eastern Roumelia, on the south slope of the Balkans, 50 miles N. E. of Philippopolis. It has in its vicinity extensive gardens of roses, numerous orchards and mineral springs. Pop. 19,428.

Eski-Shehr (es'ke-she'hr), a town of Asiatic Turkey, 90 miles S. E. of the Sea of Marmora, with warm baths and manufactures of meerschaum pipes from the deposits of that substance in the neighborhood. Pop. about 20,000.

Esmarch (es'märk), JOHANNES FRIEDRICH AUGUST, a German surgeon; born in 1823; died in 1908. He held high official positions during the Schleswig-Holstein and Franco-German wars; was a great authority on gunshot wounds; originated valuable improvements

in barrack-hospitals, ambulances, etc.; and was the author of several surgical works.

Esneh (es'ne), a town of Upper Egypt, on the left bank of the Nile, 28 miles s. s. w. of Thebes, capital of a province of same name, on the site of the ancient Latopolis. Among the ruins there is a beautiful portico of twenty-four lofty and massive columns, belonging to a temple of Kneph (the only portion of the temple cleared out), and erected in the Ptolemaic and Roman period, with a zodiac on the ceiling. Esneh is the entrepôt of the Senaar caravans; has manufactures of cottons, pottery, etc.; and is reckoned the healthiest place in Egypt. Pop. 16,000.

Esocidæ (es-ok'i-dē), the family of fishes to which the true pike (*Esox lucius*) belongs, as also the mascalonge (*E. nobilior*) of America.

Esop (ē'sop). See *Æsop*.

Espalier (es-pal'yėr), in gardening, a sort of trellis-work on which the branches of fruit trees or bushes are extended horizontally, with the object of securing for the plant a freer circulation of air as well as a full exposure to the sun. Trees thus trained are not subjected to such marked nor so rapid variations of temperature as wall trees.

Esperanto (es-per-an'tō), an artificial international language invented by Dr. Zamenhof, of Warsaw.

Espionage Act. The espionage bill became a law with its approval by President Wilson on June 15, 1917. As enacted into law the bill does not carry the press censorship clause, which was the chief subject of debate. A summary of the bill follows:

Section (1) describes what constitutes the various forms of espionage and provides penalties, (2) gives the government power in times of national emergency over the vessels in ports of the United States, (3) provides penalties for those injuring vessels engaged in foreign commerce, (4) provides penalties for those interfering with the exportation of articles from the United States by violent means, (5) empowers the President to take steps toward the enforcement of neutrality, (6) gives the government authority to seize arms or other articles intended for export in violation of law, (7) clothes the President with power to forbid the export of such articles as he sees fit and provides penalties for those seeking to evade the embargo, (8) provides penalties for those guilty of acts tending to disturb foreign relations, (9) fixes regulations with regard to passports and provides penalties for violation of regulations, (10) provides penalties for counterfeiting or tampering with official documents, (11) authorizes the issuance of search warrants under special circumstances and fixes penalties for interference with officers of the government, (12) forbids the use of the mails for forwarding treasonable matter and fixes penalties, (13) extends the provisions of the bill to the Canal Zone and the insular possessions of the United States.

Espirito Santo (es-pē're-tō sän'tō; 'Holy Spirit'), a maritime province of Brazil, bounded north by Bahia, south by Rio de Janeiro; length, about 260 miles; breadth, about 120 miles; area, 17,316 square miles. Pop. 209,783.

Espiritu Santo (es-pē're-tō sän'tō), an island of the Pacific, the largest of the New Hebrides, with some 15,000 inhabitants.

Esplanade (es-plan-ād'), in fortification, the wide open space left between a citadel and the nearest houses of the city. The term is also frequently applied to a kind of terrace, especially along the seaside, for public walks or drives.

Esquimault (es-kē'mâlt), a harbor and naval station on the southeast coast of Vancouver Island, about 3 miles from Victoria, the capital of British Columbia. The harbor is almost landlocked, and with the 'Royal Roads' outside, is capable of giving safe anchorage to a fleet of vessels of the largest size. It is the station of British naval ships on the Pacific coast, and is being fortified and provided with all the necessaries of a first-class naval arsenal.

Esquimaux (es'ki-mōz), or ESKIMOS, (as the name is now more generally spelled), a race inhabiting the Arctic coasts of North America, from Greenland to Bering Strait, and extending into Asia. They call themselves *Inu-it*, the people; their other name is from an Algonquin word signifying eaters of raw flesh. They consist of three principal stocks—the Greenlanders; the Esquimaux proper, in Labrador; and the Western Esquimaux, found along Hudson Bay, the west side of Baffin Bay, the polar shores as far as the mouths of the Coppermine and Mackenzie rivers, and both on the American and Asiatic sides of Bering Strait. Their leading physical peculiarities are a stunted stature, flattened nose, projecting cheek-bones, eyes often oblique and yellow and brownish skin. Sealskins, reindeer and other furs are used as materials for dress, according to the season, as well as skins of otters, foxes, martens, etc.

Photo by Brown Bros.

ESKIMOS IN UNUSUAL SURROUNDINGS

A photo taken on board an Arctic explorer's ship showing a group of Eskimos who had joined the party.

In summer they live in tents, covered with skins; in winter they may be said to burrow beneath the snow. In Greenland houses built of stone and cemented with turf are used as permanent habitations, and houses made of slabs of frozen snow for use when traveling or hunting. Vegetation being extremely stunted within the limits of their territories, their food consists of the flesh of whales, seals, walrus, etc., often eaten raw; and they show remarkable skill in fishing and hunting. Their weapons are bows and arrows, spears or lances, generally pointed with bone, but sometimes with metal. Their only domestic animal is the Esquimaux dog (which see). In intellect they are by no means deficient; in manners they are kind and hospitable. Their religious ideas appear scanty, but success has attended the labors of the Danish missionaries in teaching them the Christian religion.

Esquimaux Dog, or ESKIMO DOG, a breed of dogs extensively spread over the northern regions of America and of Eastern Asia. It is rather larger than the English pointer, but appears smaller on account of the shortness of its legs. It has oblique eyes, an elongated muzzle, and a bushy tail, which give it a wolfish appearance, and it is wild and wolfish in its habits. The color is generally a deep dun, obscurely barred and patched with darker color. It is the only beast of burden in these latitudes, and with a team of such dogs attached to his sledge the Esquimaux will cover 60 miles a day for several successive days.

Esquire (es'kwīr; old Fr. *escuyer*, from L. *scutum*, a shield), originally, a shield-bearer or armor-bearer; an attendant on a knight; hence in modern times a title of dignity next in degree below a knight. In England this title is properly given to the younger sons of noblemen, to officers of the king's courts and of the household, to counselors at law, justices of the peace while in commission, sheriffs, gentlemen who have held commissions in the army and navy, etc. It is usually given to all professional and literary men, and, nowadays, in the addresses of letters, *esquire* may be put as a complimentary adjunct to almost any person's name. In heraldry the helmet of an esquire is represented sideways, with the vizor closed.

Esquiros (es-kē-ros), HENRI ALPHONSE, a French poet romancist, and miscellaneous writer, born at Paris in 1814; died at Versailles in 1876. His first work, a volume of poetry, *Les Hirondelles*, appeared in 1834. This was followed by numerous romances, and a commentary on the life of Christ, *L'Evangile du Peuple*, for which he was prosecuted and imprisoned. He then published *Les Chants d'un Prisonnier*, poems written in prison; *Les Vierges Folles; Les Vierges Sages; L'Histoire des Montagnards*; etc. Having to leave France in 1851, he resided for years in England, and wrote a series of essays for the *Revue des Deux Mondes* on English life and character, which were translated under the title of *The English at Home*, and were very popular. He also wrote a similar work on the Dutch.

Essay (es'ā), a composition in which something is attempted to be proved or illustrated, usually shorter and less methodical and finished than a systematic or formal treatise; so that it may be a short disquisition on a subject of taste, philosophy or common life. Caution or modesty has induced many writers of note to give the title of essay to their most elaborate productions; thus we have Locke's *Essay on the Human Understanding*. There is a class of English writers to whom the descriptive term *essayist* is applied. *The Spectator*, *The Tatler*, *The Rambler*, and many other extensive collections of brief treatises embracing every variety of subjects are among the works of this class of writers.

Essek (es'ek). See *Essek*.

Essen (es'en), a town of Rhenish Prussia, 18 miles northeast of Düsseldorf, founded in the ninth century, and adorned with a fine church dating from 873. It has recently increased with great rapidity, and is celebrated for the steel and iron works of Krupp, the most extensive in Europe, employing about 40,000 workmen. This great establishment was started in 1827, with only two workmen. The works occupy 1000 acres, and the firm possesses coal and iron-stone mines. The rifled steel cannon made here are supplied to most of the armies of Europe. In the Krupp works there is now a steam-hammer of 150 tons. Pop. in 1910, including Altendorf, incorporated with it in 1900, 294,629.

Essence (es'ens), a solution of volatile or essential oils in spirits. See *Essential Oils*.

Essenes (es-sēnz'), or ESSENIANS, a sect among the Jews, the origin of which is unknown, as well as the etymology of their name. It appears to have sprung up in the course of the century preceding the Christian era, and

disappeared on the dispersion of the Jews after the siege of Jerusalem. The sect appears to have been an outcome of Jewish mysticism and asceticism, which gradually assumed the form of a distinct organization. Its members were remarkable for their strictness and abstinence and had a rule of life analogous to that of a monastic order. Their doctrines had an interesting resemblance to several of those of the Christian dispensation.

Essential Oils (e-sen'shal), volatile oils usually drawn from aromatic plants by subjecting them to distillation with water, such as the oils of lavender, cloves, peppermint, etc.

Essequibo (es-se-kē'bō), a river of British Guiana, which flows into the Atlantic by an estuary 20 miles in width, after a course of about 450 miles. The district or division of Essequibo is well cultivated and extremely fertile producing coffee, cotton, cocoa and sugar. Pop. about 55,000.

Essex (es'seks), a maritime county in the S. E. of England, bounded by Suffolk, the Thames, Hertford and Middlesex; area, 1542 sq. miles. The surface is generally level, except in the N. W., where it is undulating and sometimes hilly. The soil is in general extremely fertile, and particularly well adapted for the growth of wheat. Beans and peas also thrive uncommonly well. The other principal productions are potatoes, barley, oats, mangolds, turnips, tares, rape, mustard and trefoil. The raising of caraway, coriander and teazel is almost peculiar to this county. It had formerly a great extent of forest, the only survival of which is Epping Forest. The principal rivers in the county are the Roding, Crouch, Chelmer, Blackwater, Colne, etc. It has also the Thames, Lea and Stour as boundary rivers. On the coast are some valuable oyster-beds, the oysters from which are exported in considerable quantities. The manufactures of the county are not very extensive, the chief being crape silks, straw plait, etc. The chief towns are Chelmsford, the county town; West Ham, Colchester, Maldon and Harwich. Pop. (1911) 1,062,000.

Essex, Earl of. See *Cromwell, Thomas.*

Essex, Robert Devereux, Second Earl of, was born in 1567. Having appeared at court, he soon became a favorite of Queen Elizabeth, by whom he was kept in attendance against his will during the danger of the Armada. He served with more or less distinction in expeditions to Portugal and France, the latter on behalf of Henry of Navarre. In 1596 he was commander of the troops in an expedition against Spain, and distinguished himself by the capture of Cadiz. In an expedition next year he was less fortunate, and the queen, with whom he was always quarreling, received him coldly. Presuming on the favor of Elizabeth, he behaved with rudeness to her at a privy-council and received a box on the ear, and was told to 'go and be hanged.' After some months a reconciliation took place, and he was appointed lord-lieutenant of Ireland (1599), which was then in a state of rebellion. He returned to England in September, having been entirely unsuccessful in his government. He was made a prisoner in his own house, and foolishly tried to excite an insurrection in London. After a skirmish with a party of soldiers he was compelled to surrender, and sent to the Tower. He was tried for treason on February 19, and executed on February 26, 1601.

Esslingen (es'ling-ĕn), a town of Germany, in Würtemberg, on the Neckar, 7 miles E. S. E. of Stuttgart. It is of Roman origin, was long an imperial free town, has walls flanked with towers, a castle and an ancient Gothic church, with a tower 230 feet high. It has manufactures of machinery, articles of wood, cutlery, philosophical instruments, spinning and other mills, etc. Pop. (1905) 29,750.

Es-souan. See *Assouan.*

Established Church (es-tab'lisht), a church having a form of doctrine and government established by law in any country for the teaching of Christianity within its boundaries, and usually endowed by the state. The upholders of the establishment theory maintain that it is the duty of a state to provide for the religious instruction of the people. On the other hand, it is argued tha the state has no right to endow or support any particular sect or denomination, unless they assume that that denomination alone is possessed of religious truth and worth. While this is a common institution in Europe, the United States has no established church.

Estafette (es-ta-fet'), a courier who carries his message in conjunction with others by relay.

Estaminet (es-tâ-mi-nâ; French), a café where smoking is permitted.

Estancia (es-tan'si-a), an estate or farm in Spanish South America, especially one on which cattle are reared.

Estate (es-tāt'), the interest or quantity of interest a man has in lands, tenements or other effects. Estates are *real* or *personal*. *Real estate* comprises lands, tenements, and hereditaments, held in freehold. *Personal estate* comprises interests for terms of years in lands, tenements and hereditaments and property of every other description. *Real* estate descends to heirs; *personal* to executors or administrators. In ordinary language, an estate is a piece of landed property; a definite portion of land in the ownership of some one.

Estates of the Realm, in Britain, are the lords spiritual, the lords temporal and the commons. From the circumstance that the lords spiritual and temporal meet in one house, and practically form one branch of the legislature, the popular error has arisen that the sovereign forms one of the three estates of the realm.

Este (es'tā), a town of North Italy, 16 miles s. w. of Padua. It has a castle, the cradle of the Este family. Manufactures of silk goods, earthenware and majolica; numerous silk mills and whetstone quarries. Pop. of commune 10,902.

Este, one of the most ancient and illustrious of the families of Italy. In the eleventh century the house of Este became connected by marriage with the German Welfs or Guelphs, and founded the German branch of the house of Este, the dukes of Brunswick and Hanover. The sovereigns of Ferrara and Modena were of this family, several of them being famous as patrons of letters. The lives of Boiardo, Ariosto and Tasso were closely connected with members of this house. The last male representative of the Estes died in 1798. His daughter married a son of the German emperor Francis I, and her grandson disappeared from the land of his forefathers at the consummation of Italian unity in 1860.

Estella (es-tel'yā), a town of N. E. Spain, in Navarre, on the Ega, 24 miles southwest of Pampeluna. Pop. 5736.

Estepa (es-tā'pa), a town of Southern Spain, province of Seville, 50 miles east by south of Seville. It has a handsome Gothic church. Pop. 8591.

Estepona (es-tā-pō'nā), a seaport of Southern Spain, province of Malaga, 23 miles northeast of Gibraltar. Pop. 9310.

Esterhazy (es-ter-hā'zi), a family of Hungarian magnates, whose authentic genealogy goes back to the first half of the thirteenth century. They were zealous partisans of the house of Hapsburg, to whom, during the reigns of Frederick II and Leopold I, they lent a powerful support. Among the more prominent members of the family are—PAUL IV, PRINCE ESTERHAZY, a general and literary *savant*, 1635-1713. His grandson, NICHOLAS JOSEPH, a great patron of arts and music, founder of the school in which Hayden and Pleyel, among others, were taught, 1714-90.—NICHOLAS, PRINCE ESTERHAZY, distinguished as a field-marshal and foreign ambassador, 1765-1833.—PRINCE PAUL ANTHONY, a distinguished and able diplomatist, born in 1786; died in 1866; was successively Austrian ambassador at Dresden, Rome and Britain. He was a supporter of the national Hungarian movement.

Esther (es'ther), a Jewess, who became the queen of Ahasuerus (see *Ahasuerus*), King of Persia, and whose story is told in the book of the Old Testament called by her name. This book is supposed by some to be the composition of Mordecai himself, the uncle of the heroine. Various opinions are held regarding the time and truth of the story; but the feast of Purim which commemorates the events narrated is still observed by the Jews during the month Adar.

Esthonia (es-thō'ni-a), a maritime government of Russia, bounded by the Gulf of Finland, the Baltic, and the governments of Livonia and St. Petersburg. It includes several islands, of which the most important are Dagoe and Oesel area, about 7818 square miles. It has for the most part a flat or undulating surface. The whole of the north side, however, rises considerably above the sea, and presents to it ranges of cliffs. The Narva, which merely bounds the government on the east, is the only river of any importance; but minor streams, as well as small lakes, are very numerous. About a fourth of the surface is covered with forests of pine, birch and adler. The crops include wheat, barley and oats. The peasantry are almost all of Finnish origin and speak a Finnish dialect. It was divided between the Germans and the Danes in the 13th century and came entirely into German possession in 1346. In 1561 it passed to Sweden and in 1710 was seized by Russia. It was erected into a separate state by Germany in 1917 during the European war. Reval is the capital. Pop. 413,747.

Estivation (es-ti-vā'shun). See *Æstivation*.

Estoppel (es-top'el), in law, anything done by a party himself which puts a period to an action by closing the ground of controversy.

Estovers (es-tō'vers), in law, necessaries or supplies. *Common of estovers* is the liberty of taking the necessary wood for a house or farm from another's estate.

Estradiot (es-trad'i-ot), an Albanian dragoon or light-horseman, employed in the French army in the fifteenth and sixteenth centuries. They sometimes fought on foot as well as on horseback.

Estremadura (es-t-r-ā-m a dō'ra), a western division of Spain, consisting of the provinces of Badajos and Caceres. It is fertile, but not cultivated to its full extent. The Tagus and Guadiana intersect it east to west. Immense flocks of sheep graze on the rich plains. The area is about 16,700 sq. miles, and the pop. 818,211.

Estremadura, a maritime province of Portugal, divided by the Tagus into two nearly equal parts, of which the northern is the more mountainous. Wines and olives are the principle produce. The principal city is Lisbon. Area, about 16,000 sq. miles. Pop. 882,-410.

Estremez, or ESTREMOZ (a s h-trā-mōsh'), a town of Portugal, in the province of Alemtejo, 22 miles west from Elvas. Pop. 7920.

Estuary (es'tū-a-ri), the wide mouth of a river opening out so as to form an arm of the sea.

Eszek (es-sek'), or ESSEG, a strongly fortified town of Austria-Hungary, on the Drave, 13 miles from its confluence with the Danube. It has barracks, town house, normal school, etc., an important trade and several fairs. Pop. 24,930.

Etærio (e-tē'ri-o), ETERIO, in botany, a collection of distinct indehiscent carpels, either dry upon a fleshy receptacle as the strawberry, or dry upon a dry receptacle as the ranunculus, or fleshy upon a dry receptacle as the raspberry, the parts being small drupes.

Etampes (ā-tänp), a town of France, dep. Seine-et-Oise, 30 miles S. by W. from Paris. Pop. (1906) 8720.

Etappen (e-tap'en; Ger.), a department in continental armies the business of which is to relieve the commanders of the field army of all responsibility for their communications in the rear. The officers of this department supervise all arrangements for loading and unloading at stations, forwarding, feeding, billeting, etc.

Etawah (ā-tä'wä), a town of Hindustan, N. W. Provinces, capital of the district of same name, on the left bank of the Jumna, picturesquely situated among ravines, and richly planted with trees. It has some good buildings and a considerable trade. Pop. 42,-570. The DISTRICT has an area of 1601 square miles, and a pop. of about 806,-798.

Etching (ech'ing), the art of producing designs upon a plate of steel or copper by means of lines drawn with an *etching needle* (a fine-pointed steel tool), the lines being drawn through a coating or varnish (the *ground*), and *bitten in* by some strong acid which can only affect the plate where the varnish has been removed. See *engraving*.

Etchmiadzin. See *Armenia*.

Eteocles, Polynices (e-te'o-klēz, p o-l i-ni'sēz), two heroes of ancient Greek legend, sons of Œdipus, king of Thebes. After their father's banishment from Thebes, Eteocles usurped the throne to the exclusion of his brother, an act which led to an expedition of Polynices and others against Thebes. The two brothers fell by each other's hand. See *Antigone*.

Etesian Winds (e-tē'si-an), winds blowing at stated times of the year; applied especially to northerly and northeasterly winds which prevail at certain seasons in the Mediterranean regions.

Ethelbert (e th'el-bert), King of Kent, born about 560; died in 616. He succeeded his father, Hermenric, and reduced all the Anglo-Saxon states, except Northumberland, to the condition of dependencies. Ethelbert married Bertha, the daughter of Caribert, king of Paris, and a Christian princess, an event which led indirectly to the introduction of Christianity into England by St. Augustine. Ethelbert was the first Anglo-Saxon king to draw up a code of laws.

Ethelbert, King of England, son of Ethelwulf, succeeded to the government of the eastern side of the kingdom in 857, and in 860, on the death of his brother Ethelbald, became sole king. His reign was much disturbed by the inroads of the Danes. He died in 866.

Ethelred I (eth'el-red), King of England, son of Ethelwulf, succeeded his brother Ethelbert in 866. The Danes became so formidable in his reign as to threaten the conquest of the whole kingdom. Ethelred died in

consequence of a wound received in an action with the Danes in 871, and was succeeded by his brother Alfred.

Ethelred II, King of England, son of Edgar, born in 968, succeeded his brother, Edward the Martyr, in 978, and, for his want of vigor and capacity, was surnamed *the Unready*. In his reign began the practice of buying off the Danes by presents of money. After repeated payments of tribute he effected, in 1002, a massacre of the Danes; but this led to Sweyn gathering a large force together and carrying fire and sword through the country. They were again bribed to depart; but, upon a new invasion, Sweyn obliged the nobles to swear allegiance to him as king of England; while Ethelred, in 1013, fled to Normandy. On the death of Sweyn he was invited to resume the government, and died at London in the midst of his struggle with Canute (1016.)

Ethelwulf (eth'el-wulf), King of England, succeeded his father, Egbert, about 837; died in 857. His reign was in a great measure occupied in repelling Danish incursions; but he is best remembered for his donation to the clergy, which is often quoted as the origin of the system of tithes.

Ether (ē'ther), ÆTHER, a hypothetical medium of extreme tenuity and elasticity supposed to be diffused throughout all space (as well as among the molecules of which solid bodies are composed), and to be the medium of the transmission of light and heat, and probably also the agent active in gravitation.

Ether, in chemistry, a very light, volatile, and inflammable fluid, produced by the distillation of alcohol with sulphuric acid. It is lighter than alcohol, of a strong, sweet smell, susceptible of great expansion, and has a pungent taste. A mixture of vapor of ether with atmospheric air is extremely explosive. Its formula is $(C_2H_5)_2O$. Ether produces an intoxication of short duration, and is extensively used as an anæsthetic for surgical operations.

Etherege (eth'ē-rej), SIR GEORGE, an English writer of comedy, was born about 1636. He studied at Cambridge, traveled afterwards on the continent, and then returned to enter himself at one of the Inns of Court. But he devoted himself less to legal studies than to literature and society. In 1664 he had his first comedy represented, *The Comical Revenge, or Love in a Tub*, which was well received. Four years later his *She Would if She Could*, appeared, a brilliant play, though frivolous and immoral. Eight years afterwards (1676) he produced his best comedy, *Sir Floping Flutter, or the Man of Mode*. Etherege's plays are witty and sparkling, and the characters, genuine portraits of the men and women he saw, are vividly if lightly drawn. He died about 1688.

Etherene (ē'ther-ēn). See *Ethylene*.

Ethical Culture. Societies bearing this title originated in New York in 1876, at the instance of Mr. Felix Adler, and have extended to some other American cities and to several foreign countries. Their purpose is to deal with ethical questions without regard to creed. Their meetings are addressed by speakers on the subject of practical morality, no form of ritual being observed and no special belief demanded.

Ethics (eth'iks), otherwise called *Moral Philosophy* or *Morals*, is the science which treats of the nature and laws of the actions of intelligent beings, considered as to whether they are *right* or *wrong*, *good* or *bad*. The science is more or less closely connected with theology, psychology, politics, political economy and jurisprudence, but what most strictly belongs to it is the investigation of the principles and basis of duty or the moral law, and a inquiry into the nature and origin of the faculty by which duty is recognized. Various answers have been given to the question why we call an action good or bad, such as that it is consistent or not with the will of God, or with the nature of things, or with the greatest happiness of the greatest number, or that an inward faculty decides it to be such or such; and a great variety of *ethical* systems have been proposed. The foundations of the leading systems were laid in antiquity, the names of Socrates, Plato, Aristotle, Epicurus, the Cynics and the Stoics being especially prominent. The introduction of Christianity brought a new element into ethical speculation, and among Christians ethics were intimately associated with theology, and morality was regarded as based on and regulated by a definite code contained in the sacred writings. The speculations of the Greeks were not, however, disregarded, and some of the ablest Christian moralists (as Augustine, Peter Lombard, Erigena, Anselm, Aquinas, etc.) endeavored to harmonize the Greek theories with the Christian dogmatics. Most modern ethical systems consider the subject as apart from theology and as based on independent philosophical principles, and they fall into one of two

great classes—the utilitarian systems, which recognise, as the chief good, happiness, or the greatest possible satisfaction of the tendencies of our nature; and the rationalistic systems, which recognise that ideas of law and obligation can have their source only in reason. The first of the modern school in England was Hobbes (1588-1679). Among those who maintain the utilitarian theory of morals is Paley, who holds that men ought to act so as to further the greatest possible happiness of the race, because God wills the happiness of men, and rewards and punishes them according to their actions, the divine commands being ascertained from Scripture and the light of nature. Bentham's utilitarianism is considerably different from Paley's. It was entirely dissociated from theology or Scripture, and maintained that increase of happiness ought to be the sole object of the moralist and legislator, pleasure and pain being the sole test of actions. To utilitarianism as a special development belong the later 'evolution ethics' represented by Mr. Herbert Spencer, in which biological conceptions, such as 'the preservation of the human race, take the place of the Benthamite criterion for determining what is good and bad in actions. Another theory of ethics places the moral principle in the sentimental part of our nature, that is, in the direct sympathetic pleasure or sympathetic indignation we have with the impulses which prompt to action or expression. By means of this theory, which he treats as an original and inexplicable fact in human nature, Adam Smith explains all the phenomena of the moral consciousness. In considering the systems which recognise that the ideas of law and obligation can have their source only in reason, the question, what is the source of the laws by which reason governs, gives rise to a number of psychological theories, among which we may notice Clark's view of the moral principles as rational intuitions or axioms analogous to those of mathematics; Butler's theory of the natural authority of conscience; the position of Reid, Stewart and other members of the later intuitional school, who conceive a moral faculty implanted in man which not only perceives the 'rightness' or 'moral obligation' of actions, but also impels the will to perform what is seen to be right. Very similar, so far as classification goes, is the position of Kant, who holds that reason recognizes the immediate obligation of certain kinds of conduct, and that an action is only good when done from a good motive, and that this motive must be essentially different from a natural inclination of any kind.

Ethiopia (ē-thi-ō'pi-a), or ÆTHIOPIA (Hebrew, *Cush*), in ancient geography, the country lying to the south of Egypt, and comprehending the modern Nubia, Kordofan, Abyssinia and other adjacent districts; but its limits were not clearly defined. It was vaguely spoken of in Greek and Roman accounts as the land of the *Ichthyophag*, or fish eaters, the *Macrobii* or long livers, the *Troglodytes* or dwellers in caves, and of the *Pygmies* or dwarf races. In ancient times its history was closely connected with that of Egypt, and about the eighth century B. C. it imposed a dynasty on Lower Egypt, and acquired a predominant influence in the valley of the Nile. In sacred history Ethiopia is repeatedly mentioned as a powerful military kingdom (see particularly Isaiah, xx, 5). In the sixth century B. C. the Persian Cambyses invaded Ethiopia; but the country maintained its independence till it became tributary to the Romans in the reign of Augustus. Subsequently Ethiopia came to be the designation of the country now known as Abyssinia, and the Abyssinian monarchs still call themselves rulers of Ethiopia.

The *Ethiopian Language*, or more accurately the *Gees* language, is the old official and ecclesiastical language of Abyssinia, introduced into that kingdom by settlers from South Arabia. In the fourteenth century it was supplanted as the language of the Christian church of Abyssinia by the Amharic. It is a Semetic language resembling Aramaic and Hebrew as well as Arabic. It has a Christian literature of some importance. The principal work is a translation of the Bible, including the Old and New Testaments and Apocrypha, to which are appended some non-canonical writings, such as the *Shepherd of Hermas* and the *Book of Enoch*. The language is to some extent represented by the modern dialects of Tigre and by that spoken by some nomadic tribes of the Soudan. For the Ethiopian or Abyssinian Church, see *Abyssinia* and *Copts*.

Ethiops Mineral (ē'thi-ops), the black sulphide of mercury, prepared by rubbing mercury and sulphur together, either hot or cold.

Ethmoid Bone (eth'moid), a light spongy bone situated between the orbital processes at the root of the nose. The olfactory nerves shoot down through its numerous perforations of the nose.

Ethnology and Ethnography

(eth-nol'ō-ji, eth-nog'ra-fi), sciences treating of man, the former analyzing the social phenomena of mankind as shown in their customs, languages, institutions, etc.; the latter being more concerned with descriptive details and the orderly collection of facts relating to particular tribes and localities. Besides these terms there is the term *anthropology*, used by some to indicate the general science or natural history of mankind, of which the other two are parts. Here we can only give a few particulars bearing on the strictly ethnological and ethnographic divisions of the subject. (As to the place of man in the animal kingdom, see *Man*.) The unity or plurality of species of the human race is a question which has given rise to much discussion. The most common view has probably been that which regards all mankind as descended from Adam and Eve, attributing the great differences exhibited by different races to climate and other causes acting for a long period of time. Many have held that such differences were to be so accounted for, and that the various typical races of the earth were not descended from a single pair, but were separately created in separate localities. The belief that man may have originated from a single pair is supported by the researches of Darwin, who has shown how an accumulation of differences amounting to the appearance of a distinct species may arise from continual modifications of a single primordial form. (See *Species*.) Certainly among men the variability of the same race under different climatic conditions is very striking. Even within a comparatively small period of time physical surroundings have induced typical differences between the lithe, sparely fleshed Yankee of New England and the plump, rosy-cheeked Englishman; and the Boer of South Africa, with its dry climate, has developed a type as decidedly different from his original stock in moist Holland. The theory of the development of the human race from a single species demands a vast duration of time; and the flint implements discovered intermingled with remains of the mammoth and other extinct animals have proved that man was a contemporary of the mammoth, the cave bear and other mammalia of the geological period antecedent to our own, though how distant that period was as measured by thousands of years it is difficult to say. Another interesting point is in regard to the first home of the human race. This, of course, is quite uncertain, though we may naturally conclude that where the mammalia of the highest characteristics appear there was the possible birthplace and center of distribution of mankind.

When we attempt to classify mankind we can scarcely find any one physical characteristic belonging exclusively to a single race. At most we can only say that certain characteristics are the preponderant ones in certain races. In seeking racial characteristics ethnologists make use of various principles of classification. Some give the first place to the shape of the head. Camper, the Dutch anatomist, was the first who attempted to make a scientific distinction of races on this principle, taking as the basis of measurement the amount of the facial angle. (See *Facial Angle*.) But Camper's method, though it illustrates excellently the great differences which exist between, say, the anthropoid apes with an angle of 42°, the African negro with an angle of 70°, and the European with an angle of 80°, is without certainty, it being possible to find in the population of a single large town as wide variations of the facial angle as exist between distinct races. Camper's method was therefore superseded by the method of Blumenbach, which is based on consideration of all the chief distinctions in shape of the head, according to which he classified the human family into five varieties the Caucasian, Mongolian, Ethiopian, Malay and American. These five varieties were cut down to three by Cuvier, who treated the Malay and American as subdivisions of the Mongolian; and extended by Dr. Prichard, who divided the Caucasian class into a Semitic and an Aryan or Indo-European class. Latham's classification was into: 1, Mongolidæ (Chinese, Turks, Malays, American races, etc.); 2, Atlantidæ (African races, Jews and Arabs); 3, Japetidæ (Indo-Europeans). Among the later attempts made to find a new principle of classification we may mention that of Retzius, based on the relative length and breadth of the skull, according to which mankind is divided into *Dolichocephalic*, or long-skulled, and *Brachycephalic*, or short, broad-skulled races. Later developments of craniology have introduced a third class, the *Mesocephalic*, representing a mean between the other two. The general rule for measurement is that the longitudinal diameter being rated as 100, the lateral diameter is expressed in a percentage of these units. If the index of breadth is from 74 to 78, the skull is termed mesocephalous; if below 74, it is dolichocephalous;

alous, a narrow or long skull; if it reaches 79, it is brachycephalous, a broad or short skull. The capacity of the brain cavity is also a favorite method with some ethnologists. Here the European stands highest with 92.1 cubic inches; the Australian lowest with 81.7. The character of hair and color of skin have been used by Huxley as the basis of his classification, which divides mankind into: 1, *Ulotrichi*, crisp, or wooly haired people with yellow or black skin, comprising Negroes, Bushmen and Malays; 2, *Leiotrichi*, smooth-haired people, subdivided into Australioid, Mongoloid, Xanthochroic (fair whites), and Melanochroic (dark whites) groups. But many ethnologists hesitate to accept a classification which brings together nations apparently unrelated, such as the Australians, the ancient Egyptians, and the tribes of Southern India. On the other hand, the character of the hair is found to be one of the surest tests in separating neighboring races, such as the Papuan, and the Malayan and Australian tribes. Oscar Peschel's classification, based on a number of different particulars, such as the shape of the skull, the color of the skin, the nature and color of the hair, the shape of the features, etc., is as follows:—

1. *The Australians.*—Characters: skull of the dolichocephalic type, the jaws being also prognathous or protruded. The nose is narrow at the root, widening greatly below. The mouth is wide and unshapely. The body is thickly covered with hair; the hair is black, elliptical in section, that on the head being frizzly, and standing out so as to form a shaggy crown. The color of the skin is dark as a rule, sometimes black, though a light copper-red also occurs.

2. *The Papuans.*—This race, which is the one most closely allied to the Australians, occupies New Guinea, New Caledonia, the Solomon Islands, New Hebrides, the Fiji Islands, etc. The most distinctive mark is their peculiarly flattened and abundant hair, growing in tufts, and forming a spreading crown round the head. The skin is always dark, the skull high and narrow (dolichocephalic); the jaws prognathous; the lips fleshy and somewhat swollen; the nose hooked somewhat after the Jewish type.

3. *The Mongoloid Nations.*—To this race belong the Polynesian and Asiatic Malays, the people of Southeastern and Eastern Asia, the Tibetese, all the Northern Asiatics, with their kinsmen in Northern Europe, and lastly the aboriginal population of America. The common characteristics are: long, straight hair, circular in section; almost complete absence of beard and body hair; skin dark colored, varying from leather yellow to deep brown, sometimes inclining to red; prominent cheek-bones, and eyes in general set obliquely. The various members of the Mongoloid race may be classed under the following subdivisions: (*a*) The *Malay race*, comprising the Malays of Malacca, Sumatra, Java, etc., the inhabitants of Madagascar, the New Zealanders, the natives of the Sandwich Islands, etc. (*b*) *Southern Asiatics with monosyllabic languages*, comprising the Chinese, Indo-Chinese (Burmese, Siamese, Anamese, etc.), Tibetese, etc. (*c*) *Coreans and Japanese.* (*d*) *Northern Mongoloids of the Old World*, comprising the true Mongols, Turks, Finns, Lapps, Magyars, Bulgarians, etc., all much resembling the Chinese and Indo-Chinese group in physical characters. (*e*) *Northern Nations of doubtful position.*—The Yenisei Ostiaks, the Ainos of Yesso, the inhabitants of Saghalien, etc. (*f*) *The Bering Nations*, of which the Esquimaux, or Eskimo, are the most important. (*g*) *The American Aborigines* or Red Indians.

4. *The Dravidians or Aborigines of India.*—These tribes have the skin generally very dark, frequently quite black; their hair is long and black, not straight but crimped or curly; the hair of beard and body grows profusely; the lips are thick and fleshy, somewhat like those of the negroes, but the jaws are never prominent. The Dravidians comprise the Tamuls, Telugus, Gonds, Santals or Sonthals, etc.

5. *The Hottentots and Bushmen.*—These are tribes of little importance inhabiting South Africa. They have the hair tufted and matted, the beard scanty, the body almost hairless; the lips are full, but not so much so as with the negroes; the nose is of the snub shape; the opening of the eyes is narrow but not oblique. They are slimly built, and the Bushmen in particular low in stature; their color is yellowish or yellowish brown.

6. *The Negroes.*—The negroes inhabit Africa from the southern margin of the Sahara to the territory of the Hottentots and Bushmen, and from the Atlantic to the Indian Ocean. They display great variety in external characteristics, and what is popularly considered the typical negro is rarely met with. The color of the skin passes through every gradation, from ebony-black to dark brown, copper-red, olive or yellow. In some tribes the nose is straight, in

others hooked, though often broad and flat. The hair of the head is generally short, elliptical in section, and much crimped; that on the body is not plentiful; whiskers are comparatively rare. The negroes may be divided into the Bantu negroes (including the Kaffirs, Bechuanas, etc.) and the Soudan negroes, these divisions being based on differences in language. It is in the Soudan region that the most typical members of the negro race are found.

7. *The Mediterranean Nations.*—These include all Europeans who are not Mongoloids, the North Africans, all Western Asiatics and the Hindus. Among them are the highest members of the human race. The nothern nations have the skin quite fair; the southern have it darker; in North Africa and Eastern Asia it becomes yellow, red or brown. The nose has always a high bridge prognathism and prominence of the jaws and cheek-bones are rare; the lips are never intumescent, and in no other race are refined and noble features so frequent. Subdivisions are: (*a*) *The Hamites*, comprising the ancient Egyptians, the Copts of Egypt and the Nubians, the Berbers and Gallas. (*b*) *The Semites.*—These comprise the Jews, Arabs and Abyssinians and the ancient Canaanites, Assyrians, Babylonians and Phœnicians. (*c*) *The Indo-European or Aryan family.*—This family is divided into two branches, a European and an Asiatic. The European comprises the Germanic or Teutonic nations (English, Germans, Dutch, Danes, Norwegians, Swedes, etc.), the Romance nations (French, Italians, Spaniards, Portuguese), the Slavonians (Russians, Bohemians, Servians, etc.), the Greeks, and lastly the Celts. The Asiatic comprises the Hindus, Afghans, Persians, Armenians and Kurds. (*d*) *Europeans of doubtful position.*—These include the Basques of the northeast of Spain and southwest of France and various tribes in the Caucasus.

Ethyl (eth'il), the name given to the radicle C_2H_5, which is contained in ether and alcohol. It is a colorless gas, which is liquefied by moderate cold and pressure, and which burns with a brilliant white flame.

Ethylamine (eth'il-a-mēn), an organic base formed by the substitution of ethyl for all or part of the hydrogen of ammonia. It has the odor and many of the reactions of ammonia.

Ethylene (eth'il-ēn). See *Olefiant Gas.*

Etienne (ā-ti-ān), St., a town of Southern France, dep. Loire, on the Furens, 32 miles s. w. of Lyons. It has spacious streets with substantial houses but owing to the number of public works presents a dingy appearance. The principal buildings and institutions are the cathedral, an ancient Romanesque structure; the town house, courthouse, exchange, communal college, mining school, gallery of arts, library and museum. The town stands in the center of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast-furnaces and other ironworks in the vicinity, has manufactures of ribbons, silks, cutlery, firearms, etc. The collieries alone employ about 16,000 men. Pop. (1911) 148,656.

Etiolation (ē-ti-o-lā'shun; Fr. *étioler*, to blanch), or Blanching of plants, is a state produced by the absence of light, through which the green coloring is prevented from forming. It is effected artificially, as in the case of celery, by raising up the earth about the stalks of the plants; by tying the leaves together to keep the inner ones from the light; by covering with pots, boxes, or the like, or by setting in a dark place. The green color of etiolated plants may be restored by exposure to light.

Etiquette (et'i-ket), a collective term for the established ceremonies and usages of society, from the forms which are to be observed in particular places, such as courts, levees and public occasions, to the general forms of polite society. Among courts the Byzantine and Spanish courts, and the French court under Louis XIV and XV, have been noted for their strictness of their etiquette. Social etiquette consists in so many minute observances that a tolerable familiarity with it can be acquired only by a considerable intercourse with polite society. It is often said that all that is necessary to constitute good social manners is common sense and good feeling; but not to mention those formal rules of society which, though intrinsically worthless, demand a certain amount of respect, there are also many difficulties and emergencies in social intercourse which require peculiar tact and delicacy of judgment. Hence quickness of sympathy and a certain fineness of observation are more needed for proficiency in this sphere than pure power of intellect.

Etive (et'iv), Loch, an inlet of the sea, on the west coast of Scotland, County Argyle, nearly 20 miles long, of very unequal breadth, but at the broadest part about 1½ miles. The

scenery of its shores is very beautiful. About three miles from the sea, at Connel Ferry, a ridge of sunken rocks crossing it causes a turbulent rapid, which at half-tide forms a sort of waterfall.

Etna (et'na), or ÆTNA, MOUNT, the greatest volcano in Europe, a mountain in the province of Catania in Sicily; height, 10,874 feet. It rises immediately from the sea, has a circumference of more than 100 miles, and dominates the whole northeast part of Sicily, having a number of towns and villages on its lower slopes. The top is covered with perpetual snow; midway down is the woody or forest region; at the foot is a region of orchards, vineyards, olive groves, etc. Etna thus presents the variety of climates common to high mountains in lower latitudes, oranges and lemons and other fruits growing at the foot, the vine rather higher up, then oaks, chestnuts, beeches and pines, while on the loftiest or desert region vegetation is of quite a stunted character. A more or less distinct margin of cliff separates the mountain proper from the surrounding plain; and the whole mass seems formed of a series of superimposed mountains, the terminal volcano being surrounded by a number of cones, all of volcanic origin, and nearly 100 of which are of considerable size. The different aspects of the mountain present an astonishing variety of features—woods, forests, pastures, cultivated field, bare rocky precipices, streams of lava, masses of ashes and scoriæ, as also picturesque towns and villages. From the summit the view presents a splendid panorama, embracing the whole of Sicily, the Lipari Islands, Malta and Calabria. The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava spread over the country for forty days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. One eruption was in 1755, the year of the Lisbon earthquake. Among more recent eruptions are those of 1832, 1865, 1874, 1879. An eruption is ordinarily preceded by premonitory symptoms of longer or shorter duration.

Etna, a borough of Allegheny Co., Pennsylvania, 2 miles N. of Pittsburgh. It has rolling-mills, steel mills, tube and pipe works, electric railway supply works, etc. Pop. 5830.

Eton (ē'ton), a town of England, in Buckinghamshire, on the left bank of the Thames, and opposite Windsor, 22 miles west of London. Eton derives its celebrity wholly from its college, one of the great public schools of England, founded by Henry VI in 1440. The building, which was commenced in 1441 and finished in 1523, has received important additions in recent times in the shape of mathematical and science schools, a museum, etc. The number of scholars on the foundation is fixed at seventy, but there are about 800 other scholars (mostly the sons of wealthy parents) who are boarded in the houses of the masters. The town is connected with Windsor by a bridge across the river. Pop. (1911) 3192.

Etruria (e-trö'ri-a; Greek, *Tyrrhenia*), the name anciently given to that part of Italy which corresponded partly with the modern Tuscany, and was bounded by the Mediterranean, the Apennines, the river Magra and the Tiber. The name of Tusci or Etrusci was used by the Romans to designate the race of people anciently inhabiting this country, but the name by which they called themselves was Rasena (or perhaps more correctly Ta-rasena). These Rasena entered Italy at a very early period from the north, and besides occupying Etruria proper, extended their influence to Campania, Elba and Corsica. Etruria proper was in a flourishing condition before the foundation of Rome, in 753 B.C. It was known very early as a confederation of twelve great cities, each of which formed a republic of itself. Among the chief were Veii, Clusium, Volsinii, Arretium, Cortona, Falerii and Fæsulæ; but the list may have varied at different epochs. The chiefs of these republics were styled *lucumones*, and united the office of priest and general. They were elected for life. After a long struggle with Rome the Etruscan power was completely broken by the Romans in a series of victories, from the fall of Veii, in 396 B.C., to the battle at the Vadimonian Lake (283 B.C.). The Etruscans had attained a high state of civilization. They carried on a flourishing commerce, and at one time were powerful at sea. They were less warlike than most of the nations around them, and had the custom of hiring mercenaries for their armies. Of the Etruscan language little is known, although more than 3000 inscriptions have been preserved. It was written in characteristics essentially the same as the ancient Greek; but philologists have not as yet been able to decide with what language it is connected, nor to agree in the decipherment of almost any inscription. The Etruscans were specially distinguished by their religious in-

stitutions and ceremonies, which reveal tendencies gloomy and mystical. Their gods were of two orders, the first being nameless, mysterious deities, exercising a controlling influence in the background on the lower order of gods, who managed the affairs of the world. At the head of these was a deity resembling the Roman Jupiter (in Etruscan *Tinia*). But it is characteristic of the Etruscan religion that there was also a Vejovis or evil Jupiter. The Etruscan name of Venus was *Turan*, of Vulcan *Sethlans*, of Bacchus *Phuphluns*, of Mercury *Turms*. Etruscan art was in the main borrowed from Greece. For articles in terra cotta, a material which they used mainly for ornamental tiles, sarcophagi and statues, Etruscans were especially celebrated. In the manufacture of pottery they had made great advances; but most of the painted vases popularly known as Etruscan are undoubtedly productions of Greek workmen. (See *Etruscan Vases.*) The skill of the Etruscans in works of metal is attested by ancient writers, and also by numerous extant specimens, such as necklaces, ear-rings, bracelets, etc. The bronze candelabra, of which many examples have been preserved, were eagerly sought after both in Greece and Rome. A peculiar manufacture was that of engraved bronze mirrors. These were polished on one side and have on the other an engraved design, taken in most cases from Greek legend of mythology. The Etruscans showed great constructive and engineering skill. They were acquainted with the principle of the arch, and the massive ruins of the walls of their ancient cities still testify to the solidity of their constructions. Various arts and inventions were derived by the Romans from the Etruscans.

Etruscan Language (e-trus'kan). See *Etruria.*

Etruscan Vases, a class of beautiful ancient painted vases made in Etruria, but not strictly speaking a product of Etruscan art, since

Etruscan Vases.

they were really the productions of a ripe age of Greek art, the workmanship, subjects, style and inscriptions being all Greek. They are elegant in form and enriched with bands of beautiful foliage and other ornaments, figures and similar subjects of a highly artistic character. One class has black figures and ornaments on a red ground—the natural color of the clay; another has the figures of the natural clay color and the ground painted black. The former class belong to a date about 600 B.C., the latter date about a century later, and extend over a period of about 300 or 350 years, when the manufacture seems to have ceased. During this period there was much variety in the form and ornamentation, gold and other colors besides the primitive ones of black and red being frequently made use of. The subjects represented upon these vases frequently relate to heroic personages of the Greek mythology, but many scenes of an ordinary and even of a domestic character are depicted. The figures are usually in profile; temples are occasionally introduced; and many curious particulars may be learned from these vase pictures regarding the Hellenic ritual, games, festivities and domestic life.

Ettlingen (et'ling-en), a town of Baden, 5 miles from Carlsruhe, with manufactures of linen and cotton goods, etc. Pop. (1905) 8040.

Ettrick (et'trik), a district of Scotland, in Selkirk, through which the Ettrick water runs. It is now a sheep-pasture denuded of wood, but anciently formed part of Ettrick Forest, which included the whole country as well as parts of Peebles and Edinburghshire. The *Ettrick Shepherd*, James Hogg, was a native of this district.

Etty (et'i), WILLIAM, an English painter, born in 1787; died in 1849. He studied at the Royal Academy. He worked long without much recognition, but at length in 1820 he won public notice by his *Coral Finders.* In 1828 he was elected an academician. Among his works, which were greatly admired, is a series of three pictures (1827-31) illustrating the *Deliverance of Bethulia by Judith; Benaiah, one of David's mighty men; Women interceding for the Vanquished.* All these are very large pictures, and are now in the National Gallery of Scotland. Others of note are *The Judgment of Paris, The Rape of Proserpine, Youth at the Prow and Pleasure at the Helm.* In coloring and the representation of the nude or partially nude figure, particularly females, he displays high ability.

Etymology (et-i-mol'ō-ji), a term applied (1) to that part

of grammar which treats of the various inflections and modifications of words and shows how they are formed from simple roots; (2) to that branch of philology which traces the history of words from their origin to their latest form and meaning. Etymology in this latter sense, or the investigation of the origin and growth of words, is amongst the oldest of studies. Plato and other Greek philosophers, the Alexandrian grammarians, the scholiasts, the Roman Varro, and others wrote much on this subject. But their work is made up of conjectures at best ingenious rather than sound, and very often wild and fantastic. It was not till recent times, and particularly since the study of Sanskrit, that etymology has been scientifically studied. Languages then began to be properly classed in groups and families, and words were studied by a comparison of their growth and relationship in different languages. It was recognized that the development of language is not an arbitrary or accidental matter, but proceeds according to general laws. The result was a great advance in etymological knowledge and the formation of a new science of philology (which see).

Etzel (et'zel). See *Attila*.

Eu (*eu*), a town in Northern France, dep. Seine-Inférieure, about 17 miles northeast of Dieppe. It is notable for its old church and the celebrated Château d'Eu. Pop. (1906) 4865.

Eubœa (ū-bē'a), formerly called Negropont, a Greek island, the second largest island of the Ægean Sea. It is 90 miles in length; 30 in greatest breadth, and reduced at one point to 4 miles. It is separated from the mainland of Greece by the narrow channels of Egripo and Talanta. It is connected with the Bœotian shore by a bridge. There are several mountain peaks over 2000 feet, and one over 7000 feet. The island is well wooded and remarkably fertile. Wine is a staple product, and cotton, wool, pitch and turpentine are exported. The chief towns are Chalcis and Karysto. The island was anciently divided among seven independent cities, the most important of which were Chalcis and Eretria, and its history is for the most part identical with that of those two cities. With some small islands it forms a modern nomarchy, with a pop. of (1907) 116,903.

Eubulus (ū-bu'lus), a Greek comic writer who flourished at Athens about B.C. 375. His subjects were chiefly mythological.

Eucalyptus (ū-ka-lip'tus), a genus of trees, nat. order Myrtaceæ, mostly natives of Australia, and remarkable for their gigantic size, some of them attaining the height of 480 or 500 feet. In the Australian colonies they are known by the name of gum trees, from the gum which exudes from their trunks; and some of them have also such names as 'stringy bark,' 'iron bark,' etc. The wood is excellent for shipbuilding and such purposes. The *E. globŭlus*, or blue gum, yields an essential oil which is valuable as a febrifuge, antiasthmatic and antispasmodic; the medicinal properties of this tree also make it useful as a disinfectant and as

Blue Gum Tree (*Eucalyptus globŭlus*).

an astringent in affections of the respiratory passages. The *E. globŭlus* and the *E. amygdalīna* are found to have an excellent sanitary effect when planted in malarious districts such as the Roman Campagna, parts of which have been reclaimed by their use. This result is partly brought about by the drainage of the soil (the trees absorbing great quantities of moisture), partly perhaps by the balsamic odor given out. *E. mannifĕra* and others yield a sweet secretion resembling manna. Some yield a kind of gum kino. The *Eucalyptus* has been introduced with success into India, Algiers, the South of Europe, etc., and has been extensively planted in California, and, with the object of lessening liability to droughts, along the Central Pacific R. R.

Eucharist (ū'ka-rist; Greek *eucharistia*, from *eu*, well, and *charis*, grace), a name for the sacrament of the Lord's supper, in reference to the blessing and thanksgiving which accompany it. See *Lord's Supper*.

Euchre (ū'kẽr), a game at cards, very popular in America,

played mostly by two or four persons. After cutting for the deal, five cards are dealt (either by twos and threes or by threes and twos) to each player. The uppermost card of those undealt is turned for trump. The first player has the option either to 'order up' (*i.e.*, to make this card trump) or 'pass.' In the latter case it is left to the next player to decide if he will play first or pass, and so on till the turn of the dealer comes, who must either play on this trump or turn it down, when all the players have again their choice in turn of making a new trump or passing. If a trump is 'ordered up' or taken in the first round, the dealer may take it into his cards, discarding instead his poorest card. If the player who elects to play wins five tricks, he counts two; if he wins three tricks he counts one; if he wins fewer than three tricks he is *euchred* and each independent opponent counts two. The cards rank as at whist, except that the knave of the trump suit, called the *right bower* (from Ger. *bauer*, a peasant), is the highest card, and the knave of the other suit of the same color the second highest. In euchre, as now played, there is an additional card, known by players as the joker, which is the highest trump in every suit.

Eucken (oy'ken), RUDOLPH, a German philosopher, born at Aurich in East Friesland, January 5, 1846. He studied at Göttingen and Berlin; taught philosophy at Basel, 1871-74; and from that time became professor of philosophy at the University of Jena. In 1908 he was awarded the Nobel prize for literature. Philosophy, Eucken holds, is not mere intellectualism, but the application of vital religious inspiration to the practical problems of society. This practical idealism he describes as 'Activism.' His works best known in English are *The Life of the Spirit*, the *Truth of Religion*, and *Life's Purpose and Life's Ideal*. In 1912 he came to America as exchange professor, lecturing at Harvard.

Euclid (ū'klid; *Eucleidēs*), of Alexandria, a distinguished Greek mathematician, who flourished about 300 B.C. His *Elements of Geometry* (*Stoicheia*), in thirteen books, is still extant, and forms the most usual introduction to the study of geometry. The severity and accuracy of his methods of demonstration have as a whole never been surpassed. Besides the *Elements*, some other works are attributed to Euclid.

Euclid (*Eucleidēs*), of Megara, an ancient Greek philosopher, the founder of the Megaric school of philosophy, and a pupil of Socrates.

Eudiometer (ū-di-o m'e-tėr; Gr. *eudios*, serene), an instrument originally designed for ascertaining the purity of the air or the quantity of oxygen it contains, but now employed generally in the analysis of gaseous mixtures. It consists of a graduated glass tube, either straight or bent in the shape of the letter U, hermetically sealed at one end and open at the other. Two platinum wires, intended for the conveyance of electric sparks through any mixture of gases, are inserted through the glass near the closed end of the tube, and approach but do not touch each other. The electric spark causes chemical combination to take place between the oxygen in the gas to be analyzed and hydrogen which has been introduced into the tube, and the nature and proportion of the constituents of the gaseous mixture are determined by the diminution in volume after the passing of the spark. Or certain substances, such as caustic potash, pyrogallic acid, etc., may be introduced into the closed tube in order to absorb the gases.

Eufaula (ū-fą'la), a city of Barbour Co., Alabama, on the Chattahoochee River, 80 miles S. E. of Montgomery. It is an important shipping point for cotton, and has cotton mills, oil mills, etc. Pop. 4259.

Eugene (ū-jēn'), or FRANÇOIS EUGÈNE, Prince of Savoy, fifth son of Eugène Maurice, Duke of Savoy-Carignan, and Olympia Mancini, a niece of Cardinal Mazarin, was born at Paris, October 18, 1663. Offended with Louis XIV, he entered the Austrian service in 1683, serving his first campaign as a volunteer against the Turks. Here he distinguished himself so much that he received a regiment of dragoons. Later, at the sieges of Belgrade and Mayence, he increased his reputation, and on the outbreak of war between France and Austria he received the command of the imperial forces sent to Piedmont to act in conjunction with the troops of the Duke of Savoy. At the end of the war he was sent as commander-in-chief to Hungary, where he defeated the Turks at the battle of Zenta (Sept. 11, 1697). The Spanish war of succession brought Eugene again into the field. In Northern Italy he outmaneuvered Catinat and Villeroi, defeating the latter at Cremona (1702). In 1703 he commanded the imperial army in Germany and in coöperation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstadt or Blenheim, Eugene and Marlborough defeated the French

and Bavarians under Marshal Tallard, Aug. 13, 1704. Next year Eugene, returning to Italy, forced the French to raise the siege of Turin, and in one month drove them out of Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough, defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded. After the recall of Marlborough, which Eugene opposed in person at London, without success, and the defection of England from the alliance against France, his farther progress was in a great measure checked. In the war with Turkey, in 1716, Eugene defeated two superior armies at Peterwaradin and Temesvar, and, in 1717, took Belgrade, after having gained a decisive victory over a third army that came to its relief. During fifteen years of peace which followed, Eugene served Austria as faithfully in the cabinet as he had done in the field. He died in Vienna April 21, 1736. He was one of the great generals of modern times.

Eugene, a city, county seat of Lane Co., Oregon, on the Willamette River. It is surrounded by mountains, is noted for its beautiful scenery, fruits and flowers, and is tributary to rich timber lands. It is the seat of the University of Oregon. Pop. 12,000.

Eugenia (ū-jē'ni-a; so named in honor of Prince *Eugene*), a genus of dicotyledonous, polypetalous plants of the nat. order Myrtaceæ, nearly related to the myrtle. It contains numerous species, some of which produce delicious fruits. The allspice of pimento is the berry of the *E. pimenta*. *E. acris* is the wild clove.

Eugenic Acid (ū-jē-n'ik), or EUGENOL, an acid derived from cloves.

Eugenics (ū-jen'iks). From the word *eugeneesis* signifying the quality of breeding well and freely, the word eugenics has recently been derived. It is applied to cover the subject of proper mating in marriage, and attention to the requirements needed to produce healthy and the best quality of offspring. It extends to cover the question of whether the unfit should be permitted to marry or cohabit, and the desirability of legal control of this important subject.

Eugénie (eu-zhā-nē), MARIE DE GUZMAN, Ex-empress of the French, born at Granada, in Spain, in 1826. Her father, the Count de Montijo, was of a noble Spanish family; her mother was of Scotch extraction, maiden name Kirkpatrick. On Jan. 29, 1853, she became the wife of Napoleon III and Empress of the French. On March 16, 1856, a son was born of the marriage. When the war broke out with Germany she was appointed regent (July 27, 1870) during the absence of the emperor, but on September 4 the revolution forced her to flee from France. She went to England, where she was joined by the prince imperial and afterwards by the emperor, Camden House, Chislehurst, became the residence of the imperial exiles. On Jan. 9, 1873, the emperor died, and six years later the prince imperial was slain while with the English army in the Zulu war. In 1881 the empress transferred her residence to Farnborough in Hampshire.

Eugenius (ū-jēn'i-us), the name of four popes.—1. EUGENIUS I, elected on Sept. 8, 654, while his predecessor, Martin I, was still living; died in 657 after an unimportant rule.—2. EUGENIUS II held the see from 824-827.—3. EUGENIUS III, born at Pisa, was a disciple of St. Bernard of Clairvaux. He was raised to the popedom in 1145, was obliged to quit Rome in 1146 in consequence of the commotions caused by Arnold of Brescia; returned by the help of King Roger of Sicily in 1150, and died in 1153.—4. EUGENIUS IV, from Venice, originally called Gabriel Condolmero, was raised to the popedom in 1431. In consequence of his opposition to the council of Basel, an attempt was made to depose him. He died in 1447.

Eugubine Tables (ū'gu-bēn), the name given to seven bronze tablets or tables found in 1444 at the town of Gubbio, the ancient Iguvium or Eugubium, now in the Italian province of Perugia, bearing inscriptions in the language of the ancient Umbrians, which seems to have somewhat resembled the ancient Latin as well as the Oscan. They seem to have been inscribed three or four centuries B.C., and refer to sacrificial usuages and ritual.

Euhemerism (ū-hem'er-izm), or EUHEMERISM, a method or system (so named from its founder, Euhemerus, a Greek philosopher) of interpreting myths and mythological deities, by which they are regarded as deifications of dead heroes and poetical exaggerations of real histories.

Eulenspiegel (oi'len-spē-gl), TILL, a name which has become associated in Germany with all sorts of wild, whimsical frolics, and with many amusing stories. Some such popular hero of tradition and folklore seems to have really existed in Germany, probably in the first half of the fourteenth

century, and a collection of popular tales of a frolicsome character, originally written in Low German, purports to contain his adventures. The earliest edition of such is a Strasburg one of the year 1515 in the British Museum. Better known, however, is that of 1519, published also at Strasburg by Thomas Mürner. The work was early translated into English and almost all European tongues.

Euler (oi'lèr or ū'lèr), Leonard, a distinguished mathematician, born at Basel, in 1707, and educated at the University of Basel under the Bernouilli, through whose influence he procured a place in the Academy of St. Petersburg. In 1741 he accepted an invitation from Frederick the Great to become professor of mathematics in the Berlin Academy, but in 1766 returned to St. Petersburg, where he died in 1783, in the office of director of the mathematical class of the academy. Euler's profound and inventive mind gave a new form to the science. He applied the analytical method to mechanics and greatly improved the integral and differential calculus. He also wrote on physics, and employed himself in metaphysical and philosophical speculations. Among his numerous writings are the *Theoria Motuum Planetarum et Cometarum*, *Introductio in Analysin Infinitorum*, *Opuscula Analytica*, etc.

Eumenes (ū'me-nēz), the name of two kings of Pergamus.—1. Eumenes I succeeded his uncle, Philetærus, in B.C. 263. He reigned for twenty-two years and then died in a fit of drunkenness.—2. Eumenes II succeeded his farther, Attalus, B.C. 197, and, like him, attached himself to the Romans, who, as a reward for his services in the war against Antiochus of Syria, bestowed upon him the Thracian Chersonesus and almost all Asia on this side of the Taurus. He died in 159 B.C.

Eumenides (ū-men'i-dez). See *Furies*.

Eunomians (ū-nō'mi-anz), the followers of Eunomius, Bishop of Cyzicum, in the fourth century A.D., who held that Christ was a created being of a nature unlike that of the Father.

Eunuch (ū'nuk), a male of the human species emasculated by castration. The term is of Greek origin (*eunouchos*, from *eunē*, a couch or bed; *echein*, to hold or guard); but eunuchs became known to the Greeks no doubt from the practice among Eastern nations of having them as guardians of their women's apartments. Eunuchs were employed in somewhat similar duties among the Romans in the luxurious times of the empire, and under the Byzantine monarchs they were common. The Mohammedans still have them about their harems. Emasculation, when effected in early life, produces singular changes in males and assimilates them in some respects to women, causing them in particular to have the voice of a female. Hence, not so long ago, it was not uncommon in Italy to castrate boys in order to fit them for soprano singers when grown to manhood.

Euonymus (ū-on'i-mus), the spindle tree or prick-wood, a genus of shrubs or trees, nat. order Celastrineæ, containing about fifty species, natives of the temperate regions of the northern hemisphere. See *Spindle Tree*.

Eupataria, or Eupatoria (ū-pa-tō'ri-a), formerly Kosloff, a seaport in Russia, on the western coast of the Crimea, government of Taurida. It was here that the allied forces landed at the commencement of the Crimean war (September 14-18, 1854). Pop. 18,000.

Eupatorium (ū-pa-tō'ri-um), a genus of plants, chiefly natives of America, belonging to the nat. order Compositæ. Their roots are perennial, possessing a rough, bitter or aromatic taste; the flowers are small, white, reddish of bluish, in corymbs. Among the many species are *E. cannabinum*, or hemp-agrimony, a British plant, and *E. perfoliātum*, thoroughwort or boneset. See *Boneset*.

Eupen (oi'pen), a town in Rhenish Prussia, 7 miles S. S. W. of Aix-la-Chapelle. It has manufactures of woolen and linen cloth, hats, soap, leather and chemicals; paper, flax and worsted mills; and an important trade. The town was ceded to Prussia at the Peace of Paris in 1814. Pop. 14,297.

Euphonium (ū-fō'ni-um), a brass bass instrument, generally introduced into military bands, and frequently met with in the orchestra as a substitute for the bass trombone, from which, however, it is very different in tone. It is tuned on C or B flat, and is furnished with three or four valves or pistons.

Euphorbiaceæ (ū-for-bi-ā'se-e), the spurgeworts, a nat. order of herbaceous plants, shrubs, or very large trees, which occur in all regions of the globe. Most of them have an acrid, milky juice, and diclinous or monœcious flowers. The fruit is dry or slightly fleshy, and three lobed. Among the genera are: *Euphorbia*, which yields an oil used as a powerful cathartic; *Croton*, affording croton-oil; the

Ricinus communis, or castor-oil plant; the *Buxus sempervirens*, or boxwood plant; the *Jatrŏpha Manihot*, which yields the food known as tapioca or cassava. In most members of the genera the milky juice contains caoutchouc. See *Cassava*, *Castor-oil*, *Croton*, *Manchineel*, *Spurge*.

Euphorbium (ū-for'bi-um), a yellowish-white body which is the solidified juice of certain plants of the genus *Euphorbia*, either exuding naturally or from incisions made in the bark. It is a powerful acrid substance, virulently purgative and emetic.

Euphrasia (ū-frā'si-a). See *Eyebright*.

Euphrates (ū-frā'tēz), or El Frat, a celebrated river of Western Asia, in Asiatic Turkey, having a double source in two streams rising in the Anti-Taurus range. Its total length is about 1750 miles, and the area of its basin 260,000 sq. miles. It flows mainly in a southeasterly course through the great alluvial plains of Babylonia and Chaldæa till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About 100 miles from its mouth it is joined by the Tigris, when the united streams take the name of Shatt-el-Arab. It is navigable for about 1200 miles, but navigation is somewhat impeded by rapids and shallows. The melting of snow in the Taurus and Anti-Taurus causes a flooding in spring. The water is highest in May and June, when the current, which rarely exceeds 3 miles an hour, rises to 5.

Euphrosyne (ū-fros'i-nē; 'Mirth'), one of the three Graces. See *Graces*.

Euphuism (ū'fū-izm), an affected style of speech which distinguished the conversation and writings of many of the wits of the court of Queen Elizabeth. The name and the style were derived from the *Euphues*, the *Anatomy of Wit* (about 1580), and the *Euphues and his England* (about 1582), of John Lyly.

Eupolis (ū'pō-lis), an Athenian comic poet, who flourished about 429 B.C. Neither the date of his birth nor that of his death is known with certainty. He belongs, like Aristophanes and Cratinus, to the Old Comedy. His works are all lost except small fragments.

Eurasia (ū-rā'si-a), a term applied to Europe and Asia considered as a single continent. Geographically they form but one continent, there being no natural division between the two. Europe being practically a peninsular westward extension of Asia. Yet they are separate historically and ethnographically, and this has led to their being regarded as distinct continents.

Eurasians (ū-rā'si-anz; syncopated from Europ-Asians), a name sometimes given to the 'half-castes' of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals—Calcutta, Madras and Bombay. They generally receive an European education, and the young men are often engaged in government or mercantile offices. The girls in spite of their dark tint are generally very pretty and often marry Europeans.

Eure (eur), a river of N. W. France, which rises in the department of the Orne, and falls into the Seine after a course of 124 miles, being navigable for about half the distance.—Also the name of a department in the N. W. of France, forming part of Normandy; area, 2330 square miles. The surface consists of an extensive plain, intersected by rivers, chief of which is the Seine. Almost the whole surface is profitably occupied, the waste not amounting to one-thirtieth of the whole. Apples, pears, plums and cherries form important crops, and a little wine is produced. The mining and manufacturing industries are extensive, and the department has a considerable trade in woolen cloth, linen and cotton fabrics, carpets, leather, paper, glass. Evreux is the capital. Pop. (1906) 330,140.

Eure-et-Loir (eur-é-lwăr), a department in the N. W. of France, forming part of the old provinces of Orléannais and Ile-de-France; area, 2298 square miles. A ridge of no great height divides the department into a north and a south basin, traversed respectively by the Eure and the Loire. The soil is extremely fertile, and there is scarcely any waste land. A considerable portion is occupied by orchards and vineyards, but the greater part is devoted to cereal crops. The department is essentially agricultural, and has few manufactures. The capital is Chartres. Pop. (1906) 273,823.

Eureka (ū-rē'ka; Gr. *heurēka*, I have found it), the exclamation of Archimedes when, after long study, he discovered a method of detecting the amount of alloy in King Hiero's crown. Hence the word is used as an expression of triumph at a discovery.

Eureka, a city, county seat of Humboldt Co., California, on Humboldt Bay, 5 miles from its entrance. It is surrounded by mountains and forests of

redwood trees and ships large quantities of this lumber to San Francisco. It has lumber and woolen mills, creameries, etc. Pop. 13,500.

Euripides (ū-rip'i-dēs), a celebrated Athenian tragedian, born in B.C., 480, or, according to the Arundel marbles, 485, at Salamis. He studied under Prodicus and Anaxagoras, and is said to have begun to write tragedies at the age of eighteen, although his first published play, the *Peliades*, did not appear until 455 B.C. He was not successful in gaining the first prize till the year 441 B.C., and he continued to exhibit till 408 B.C., when he exhibited the *Orestes*. The violence of unscrupulous enemies, who accused him of impiety and unbelief in the gods, drove Euripides to take refuge at the court of Archelaus, king of Macedonia, where he was held in the highest honor. According to a tradition, he was killed by hounds in 406 B.C. Euripides was a master of tragic situations and pathos, and shows much knowledge of human nature and skill in grouping characters, but his works lack the artistic completeness and the sublime earnestness that characterize Æschylus and Sophocles. Euripides is said to have composed seventy-five, or according to another authority ninety-two, tragedies. Of these, eighteen (or nineteen, including the *Rhesus*) are extant, viz.: *Alcestis*, *Medea*, *Hippolytus*, *Hecuba*, *Heracleidæ*, *Supplices*, *Ion*, *Hercules Furens*, *Andromacha*, *Troades*, *Electra*, *Helena*, *Iphigenia in Tauris*, *Orestes*, *Phœnissæ*, *Bacchæ*, *Iphigenia in Aulis* and *Cyclops*.

Euripides.

Euripus (ū-rī'pus), in ancient geography, the strait between the island of Eubœa and Bœotia in Greece.

Euroclydon (ū-rok'li-don), a tempestuous wind of the Levant, which was the occasion of the shipwreck of the vessel in which St. Paul sailed, as narrated in Acts, xxvii, 14-44. The northeast wind is the wind evidently meant in the narrative.

Europa (ū-rō'pa), in Greek mythology, the daughter of Agēnor, king of the Phœnicians, and the sister of Cadmus. The fable relates that she was abducted by Jupiter, who for that occasion had assumed the form of a bull, and swam with his prize to the island of Crete. Here Europa bore to him Minos, Sarpēdon and Rhadamanthus.

Europe (ū'rup), the smallest of the great continents, but the most important in the history of civilisation for the last two thousand years. It forms a huge peninsula projecting from Asia, and is bounded on the N. by the Arctic Ocean; on the W. by the Atlantic Ocean; on the S. by the Mediterranean, the Black Sea and the Caucasus range; on the east by the Caspian Sea, the Ural River and the Ural Mountains. The most northerly point on the mainland is Cape Nordkyn, in Lapland, in lat. 71° 6′; the most southerly points are Punta da Tarifa, lat. 36° N., in the Strait of Gibraltar, and Cape Matapan, lat. 36° 17′, which terminates Greece. The most westerly point is Cape Roca in Portugal in lon. 9° 28′ W., while Ekaterinburg is in lon. 60° 36′ E. From Cape Matapan to North Cape is a direct distance of 2400 miles, from Cape St. Vincent to Ekaterinburg, northeast by east, 3400 miles; area of the continent, about 3,800,000 square miles. Great Britain and Ireland, Iceland, Nova Zembla, Corsica, Sardinia, Sicily, Malta, Crete, the Ionian and the Balearic islands are the chief islands of Europe. The shores are very much indented, giving Europe an immense length of coast line (estimated at nearly 50,000 miles). The chief seas or arms of the sea are: the White Sea on the north; the North Sea or German Ocean on the west, from which branches off the great gulf or inland sea known as the Baltic; the English Channel, between England and France: the Mediterranean, communicating with the Atlantic by the Strait of Gibraltar (at one point only 19 miles wide); the Adriatic and Archipelago, branching off from the Mediterranean; and the Black Sea, connected with the Archipelago through the Hellespont, Sea of Marmora and Bosporus.

Surface.—The mountains form several distinct groups or systems of very different geological dates, the loftiest mountain masses being in the south-central region. The Scandinavian mountains in the northwest, to which the great northern peninsula owes its form, extend above 900 miles from the Polar Sea to the south point of Norway. The highest summits are about 8000 feet. The Alps, the highest mountains in Europe (unless Mount Elbrus in the Caucasus is claimed as European), extend from the Mediterranean first in a northerly and then in an easterly direction, and attain their great-

est elevation in Mont Blanc (15,781 feet), Monte Rosa, and other summits. Branching off from the Alps, though not geologically connected with them, are the Apennines, which run southeast through Italy, constituting the central ridge of the peninsula. The highest summit is Monte Corno (9541 feet). Mount Vesuvius, the celebrated volcano in the south of the peninsula, is quite distinct from the Apennines. By southeastern extensions the Alps are connected with the Balkan and the Despoto-Dagh of the southeastern peninsula of Europe. Among the mountains of Southwestern Europe are several massive chains, the loftiest summits being in the Pyrenees, and in the Sierra Nevada in the south of the Iberian Peninsula. The highest point in the former, La Maladetta or Mont Maudit, has an elevation of 11,165 feet; Mulahacen, in the latter, is 11,703 feet, and capped by perpetual snow. West and northwest of the Alps are the Cevennes, Jura and Vosges; north and northeast the Harz, the Thüringerwald Mountains, the Fichtelgebirge, the Erzgebirge and Böhmerwaldgebirge. Farther to the east the Carpathian chain encloses the great plain of Hungary, attaining an elevation of 8000 or 8500 feet. The Ural Mountains between Europe and Asia reach the height of 5540 feet. Besides Vesuvius other two volcanoes are Etna in Sicily and Hecla in Iceland. A great part of northern and eastern Europe is level. The *great plain* of North Europe occupies part of France, Western and Northern Belgium, Holland, the northern provinces of Germany and the greater part of Russia. A large portion of this plain, extending through Holland and North Germany, is a low, sandy level not unfrequently protected from inroads of the sea only by means of strong dykes. The other great plains of Europe are the plain of Lombardy (the most fertile district in Europe) and the plain of Hungary. Part of Southern and Southeastern Russia consists of steppes, broad, treeless levels, devoted principally to pasturage.

Rivers and Lakes.—The main European watershed runs in a winding direction from southwest to northeast, its northeastern extremity being of very slight elevation. From the Alps descend some of the largest of the European rivers, the Rhine, the Rhone and the Po, while the Danube, a still greater stream, rises in the Black Forest north of the Alps. The Volga, which enters the Caspian Sea, an inland sheet without outlet, is the longest of European rivers, having a direct length of nearly 1700 miles, or 2400 including windings. Into the Mediterranean flow the Ebro, the Rhone and the Po; into the Black Sea, the Danube, Dnieper, Dniester and Don (through the Sea of Azov); into the Atlantic, the Guadalquivir, the Guadiana, the Tagus and Loire; into the English Channel the Seine; into the North Sea, the Rhine and Elbe; into the Baltic, the Oder, Vistula and Duna; into the Arctic Ocean, the Dwina. The lakes of Europe may be divided into two groups, the southern and the northern. The former run along both sides of the Alps, and among them, on the north side, are the lakes of Geneva, Neuchâtel, Thun, Lucerne, Zürich and Constance; on the south side, Lago Maggiore and the lakes of Como, Lugano, Iseo and Garda. The northern lakes extend across Sweden from west to east, and on the east side of the Baltic a number of lakes, stretching in the same direction across Finland on the borders of Russia, mark the continuation of the line of depression. It is in Russia that the largest European lakes are found—Lakes Ladoga and Onega.

Geology.—The geological features of Europe are exceedingly varied. The older formations prevail in the northern part as compared with the southern half and the middle region. North of the latitude of Edinburgh and Moscow there is very little of the surface of more recent origin than the strata of the Upper Jura belonging to the mesozoic period, and there are vast tracts occupied either by eruptive rocks or one or other of the older sedimentary formations. Denmark and the portions of Germany adjoining belong to the Cretaceous period, as does also a large part of Russia between the Volga and the basin of the Dneiper. Middle and Eastern Germany with Poland and the valley of the Dneiper present on the surface Eocene formations of the tertiary period. The remainder of Europe is remarkable for the great diversity of its superficial structure, rocks and deposits belonging to all periods being found within it, and having for the most part no great superficial extent. Europe possesses abundant stores of those minerals which are of most importance to man, such as coal and iron, Britain being particularly favored in this respect. Coal and iron are also obtained in France, Belgium and Germany. Gold is found to an unimportant extent, and silver is widely spread in small quantities. The richest silver ores are in Norway, Spain, the Erzgebirge and the Harz Mountains. Spain is also rich in quicksilver. Copper ores are abundant in the Ural Mountains, Thuringia, Cornwall

and Spain. Tin ores are found in Cornwall, the Erzgebirge and Brittany.

Climate.—Several circumstances concur to give Europe a climate peculiarly genial, such as its position almost wholly within the temperate zone, and the great extent of its maritime boundaries. Much benefit is also derived from the fact that its shores are exposed to the warm marine currents and warm winds from the southwest, which prevent the formation of ice on most of its northern shores. The eastern portion has a less favorable climate than the western. The extremes of temperature are greater, the summer being hotter and the winter colder, while the lines of equal mean temperature decline south as we go east. The same advantages of mild and genial temperature which western has over eastern Europe the continent collectively has over the rest of the Old World. The diminution of mean temperature, as well as the intensity of the opposite seasons, increases as we go east. Peking, in lat. 40° N., has as severe a winter as Petrograd in lat. 60°.

Vegetable Productions.—With respect to the vegetable kingdom Europe may be divided into four zones. The first, or most northern, is that of fir and birch. The birch reaches almost to North Cape; the fir ceases a degree farther south. The cultivation of grain extends farther north than might be supposed. Barley ripens even under the seventieth parallel of north latitude; wheat ceases at 64° in Norway, 62° in Sweden. Within this zone, the southern limit of which extends from lat. 64° in Norway to lat. 62° in Russia, agriculture has little importance, its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of Southern Europe. Here the oak still flourishes, but the pine species become rarer. Rye, which characterizes the preceding zone on the continent, gives way to wheat, and in the southern portion of it to maize also. The fourth zone, comprehending the southern peninsulas, is that of the olive and evergreen woods. The orange flourishes in the southern portion of it, and rice is cultivated in a few spots in Italy and Spain.

Animals.—As regards animals, the reindeer and polar bears are peculiar to the north. In the forests of Lithuania a herd of the European bison is found. Bears and wolves still inhabit the forests and mountains; but, in general, cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty north of the Pyrenees and Alps. The Mediterranean Sea has many species of fish, but no great fishery; the northern seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod and salmon.

Inhabitants.—Europe is occupied by several different peoples or races, in many parts now greatly intermingled. The Celts once possessed the west of Europe from the Alps to the British Islands. But the Celtic nationalties were broken by the wave of Roman conquest, and the succeeding invasion of the Germanic tribes completed their political ruin. At the present day the Celtic language is spoken only in the Scotch Highlands (Gaelic), in some parts of Ireland (Irish), in Wales (Cymric), and in Brittany (Armorican). Next to the Celtic comes the Teutonic race, comprehending the Germanic and Scandinavian branches. The former includes the Germans, the Dutch and the English. The Scandinavians are divided into Danes, Swedes and Norwegians. To the east, in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Russians, the Poles, the Czechs or Bohemians, the Servians, Croatians, etc. In the south and southeast of Europe are the Greek and Latin peoples, the latter comprising the Italians, French, Spanish and Portuguese. All the above peoples are regarded as belonging to the Indo-European or Aryan stock. To the Mongolian stock belong the Turks, Finns, Lapps and Magyars or Hungarians, all immigrants into Europe in comparatively recent times. The Basques at the western extremity of the Pyrenees are a people whose affinities have not yet been determined. The total population of Europe is about 330,000,000; nine-tenths speak the languages of the Indo-European family, the Teutonic group numbering about 108,000,000, the Slavonic and Latin over 95,000,000 each. The prevailing religion is the Christian, embracing the Roman Catholic Church, which is the most numerous, the various sects of Protestants (Lutheran, Calvinistic, Angli-

can, Baptist, Methodist, etc.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion.

Political Divisions.—The states of Europe as they existed at the beginning of the European war (1914-18) are given below. Since then several new nations have been formed, chiefly Poland, Czecho-Slovakia, Jugo-Slavia, Finland. (See the separate articles.) Andorre, Monaco and San Marino are independent states.

States.	Area in Eng. sq. miles.	Population.	Designation.
Austria-Hungary	261,035	49,418,596	Empire.
Liechtenstein	68	9477	Principality.
Belgium	11,373	7,074,910	Kingdom.
Bulgaria	37,200	4,284,844	Principality.
Denmark	15,388	2,585,660	Kingdom.
Iceland	39,756	78,470	Protectorate.
France	207,054	38,961,945	Republic.
Germany	208,830	64,903,423	Empire.
Britain	11, 121,331	46,094,730	Kingdom.
Greece	25,014	2,433,806	Kingdom.
Netherlands	12,648	5,898,429	Kingdom.
Luxemburg	999	230,543	Grand-duchy.
Italy	110,550	32,475,253	Kingdom.
Montenegro	3,630	228,000	Kingdom.
Portugal	35,490	5,423,132	Republic.
Roumania	50,720	5,912,520	Kingdom.
Russia	1,862,514	125,201,900	Republic.
Servia	18,630	2,493,770	Kingdom.
Spain	194,783	19,503,008	Kingdom.
Sweden	172,876	5,476,441	Kingdom.
Norway	124,129	2,302,698	Kingdom.
Switzerland	15,976	3,741,971	Confederative Republic.
Turkey	65,350	6,130,200	Empire.

History.—Europe was probably first peopled from Asia, but at what date we do not know. The first authentic history begins in Greece at about 776 B.C. Greek civilization was at its most flourishing period about 430 B.C. After Greece came Rome, which, by the early part of the Christian era, had conquered Spain, Greece, Gaul, Helvetia, Germany between the Danube and the Alps, Southern Britain, Illyria, Dacia, etc. Improved laws and superior arts of life spread with the Roman Empire throughout Europe, and the unity of government was also extremely favorable to the extension of Christianity. With the decline of the Roman Empire a great change in the political constitution of Europe was produced by the general migration of the northern nations. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. Under Charlemagne (771-814) a Great Germanic empire was established, so extensive that the kingdoms of France, Germany, Italy, Burgundy, Lorraine and Navarre were afterwards formed out of it. About the time the northern and eastern nations of Europe began to exert an influence in the affairs of Europe. The Slavs, or Slavonians, founded kingdoms in Bohemia, Poland, Russia and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe, founding kingdoms and principalities in England, France, Sicily and the East. The Crusades and the growth of the Ottoman power are among the principal events which influenced Europe from the twelfth to the fifteenth century. The conquest of Constantinople by the Turks (1453), by driving the learned Greeks from this city, gave a new impulse to letters in Western Europe, which was carried onward by the invention of printing and the Reformation. The discovery of America was followed by the temporary preponderance of Spain in Europe, and next to France. Subsequently Prussia and Russia gradually increased in territory and strength. The French revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German Empire being one of the results. Since then the most important events in European history have been the establishment of the independence of Greece; the disappearance of Poland as a separate state; the

unification of Italy under Victor Emmanuel; the Franco-German war, resulting in the consolidation of Germany into an empire under the leadership of Prussia; the gradual dismemberment of the Turkish empire; and the re-drawing of the map of Europe as a result of the Great War of 1914-18.

European War. This greatest of all wars, which was first called the European war, but which, following America's entrance, came to be known as the World War, was precipitated by the German Junkers through their [illegible] in Austria-Hungary in August, 1914, and ended in a total defeat of [illegible] in November, 1918. For forty [illegible] Germany had [illegible] She would [illegible] She called to [illegible] sister autocracies: Turkey, a [illegible] the whips of a long line of bloody [illegible]; monarchs Bulgaria, one of the Balkan states smarting under a sense of injury as the result of the Balkan wars, and ruled by a Teutonic king, who plunged the nation into a war in which its people had no choice and little sympathy; and Austria-Hungary, a conglomerate of races in which a Teutonic minority ruled with an iron scepter.

Against this phalanx of autocracy 24 nations arrayed themselves: Belgium, Brazil, China, Costa Rica, Cuba, France and her colonies, Guatemala, Great Britain and her colonies, Greece, Haiti, Honduras, Italy, Japan, Liberia, Montenegro, Nicaragua, Panama, Portugal and her colonies, Roumania, Russia, San Marino, Serbia, Siam and the United States.

Belgium, with a population of 8,000,000, had a casualty list of more than 350,000; France, out of a population of 90,000,000, including colonies, lost 4,000,000, while Russia nearly doubled this total, the casualties reaching 7,000,000 out of a total population of 180,000,000. The United States had 4,000,000 men under arms when the conflict ended; more than two million of these were upon the fields of France and Italy; total casualties of the American Army amounted to 236,117. The British Empire raised an army of 7,000,000 and fought seven foreign campaigns: in France, Italy, Mesopotamia, Dardanelles, Macedonia, East Africa and Egypt. The empire had a casualty list of 3,049,992; of these 658,665 were killed. Canada alone raised an army of over half a million; of these 418,980 had gone overseas when the war ended. Canadian troops sustained 220,182 casualties; 155,790 had been wounded, and more than 60,000 paid the supreme sacrifice. Italy, with a population of 36,000,000, and with 5,500,000 men called to the colors, suffered approximately 1,500,000 casualties. Germany's casualty list amounted to 6,338,000; Austria-Hungary lost 4,500,000, Turkey 750,000 and Bulgaria 200,000. The total estimated casualties of the Entente Allies was 15,836,000; those of the Central Powers, 11,788,000; a grand total of 27,624,000, of which the dead alone numbered nearly 8,000,000. The money cost to the Entente Allies was $172,000,000,000; the cost to the Central Powers was $77,000,000,000, a grand total of estimated cost in money of $249,000,000,000.

This was the colossal price in blood and treasure that the free nations of the world had to pay to rid the earth of the blight of Teutonic kultur with its materialistic creed.

The pretext for the opening of hostilities was the assassination, on June 28, 1914, by a Serbian student, of the Archduke Francis Ferdinand, heir to the dual throne of Austria-Hungary, and his wife, while on a visit to Sarajevo, Bosnia. Backed by the German war-lords, Austria made certain demands on Serbia, which were refused, whereupon Austria declared war on July 28 and sent troops against Belgrade. Russia began mobilizing, and Germany declared war on Russia August 1. On the west, the Germans, disregarding their promise to maintain the neutrality of Belgium, flung their forces into that little country and, despite a glorious resistance of the Belgians, crashed their way through and poured into France. Britain by this time had come to the rescue and gallantly aided the Belgians in staying the progress of the enemy. Britain's navy was ready and promptly began the great blockade that was drawn ever tighter as the months went by. Britain's ally, Japan, entered the conflict and after a brief siege took Kiaochow and drove the Teutonic influence out of the Orient.

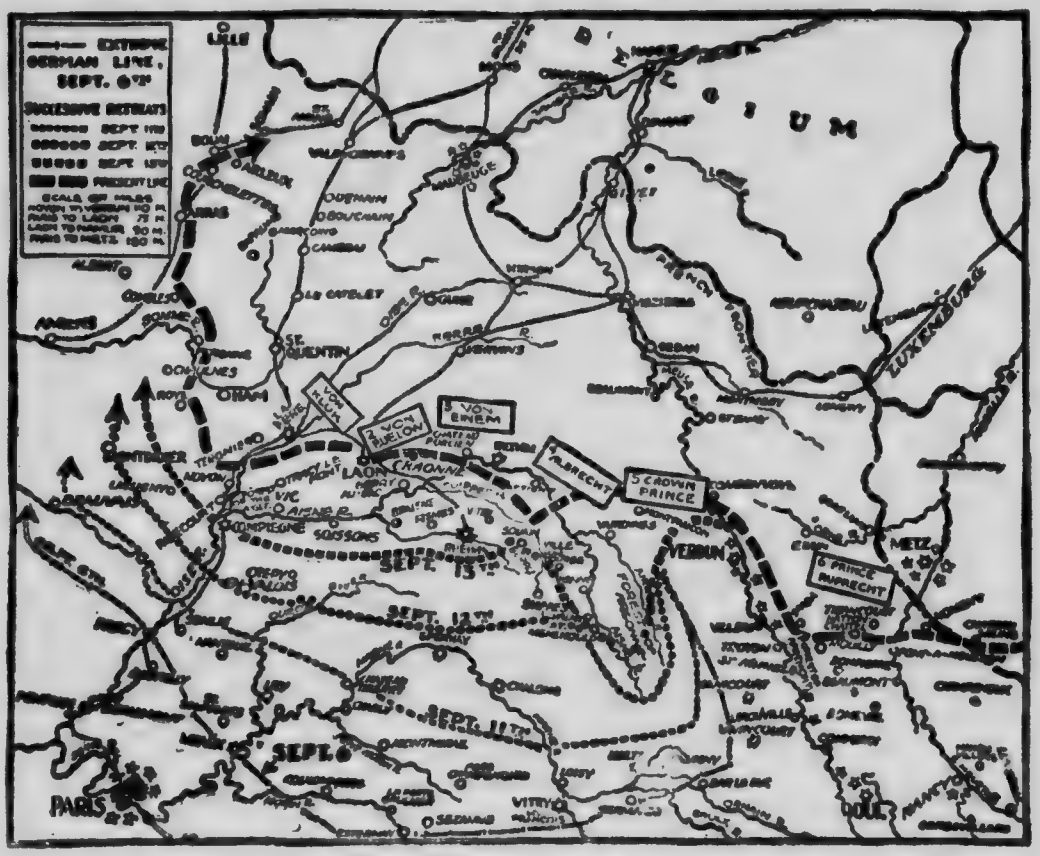
Briefly this is the story of the war year by year:

First Year of War. Belgium and Northern France were overrun by a German invading force under General von Kluck. The heroic effort of the French army under General Joffre and a supreme strategic thrust at the German center by General Foch turned back the German tide at the battle of the Marne. The scientific diabolism of the German High Command was revealed when poison gas was projected against the Canadians at Ypres, torturing, blinding and killing thousands. German terrorism on the

high seas culminated in the sinking of the Cunard liner Lusitania by a German submarine off the Irish coast. Men, women and children to the number of 1152 lost their lives. Of these 102 were Americans. German colonies in South Africa were invaded by British South African troops under General Louis Botha, who during the Boer war commanded a division against the British. The German holdings at Tsing-Tau and in the Marshall Islands were seized by Japan. German

on a sixty-mile front. Russian forces, after early successes, were defeated at Tannenburg by von Hindenburg, the outstanding military genius on the German side. The development of aircraft as an aid to artillery and as a destructive force on its own account, was rapid, and the use of machine guns and hand grenades in trench operations became general.

Second Year of War. The tragic sea and land operations at the Dardanelles and Gallipoli marked this year with red



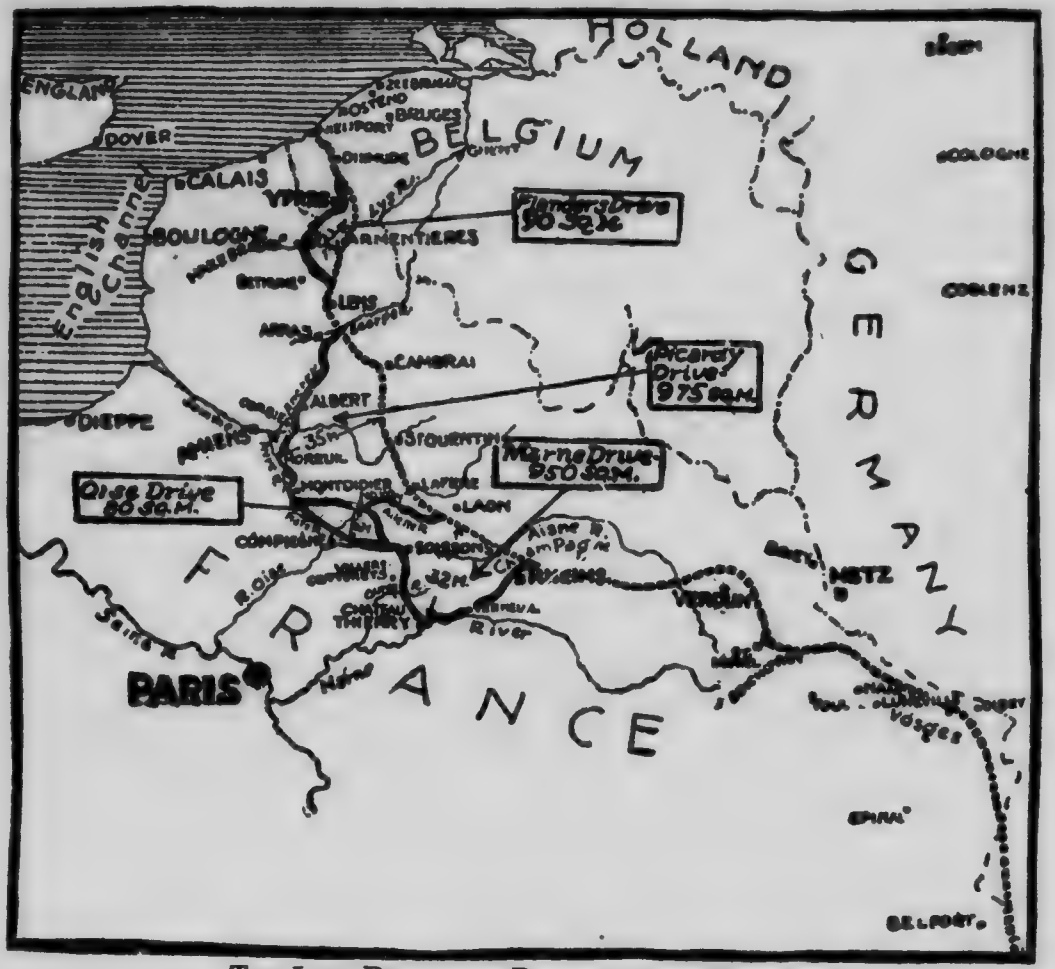
THE FIRST GERMAN DASH FOR PARIS

cruisers that had raided seagoing commerce were destroyed. The most noted of these was the Emden, which was defeated and destroyed by the Australian cruiser Sydney off the Cocos Islands. German sea power was further humiliated in a running fight off Helgoland, in which the battle cruiser Blücher was sunk, and in a battle off the Falkland Islands, in which three German cruisers were destroyed. Italy entered the war on May 23, 1915, and invaded Austria

in British history. Sir Douglas Haig succeeded Sir John French as Commander-in-Chief of British forces in France. The outstanding operation of the British forces on the western front was the bloody battle of the Somme, beginning July 1st, and continuing until the fall of 1915. The losses on both sides in that titanic struggle staggered two continents. Especially heroic were the attacks of the Canadians in that great battle and especially heavy were the losses

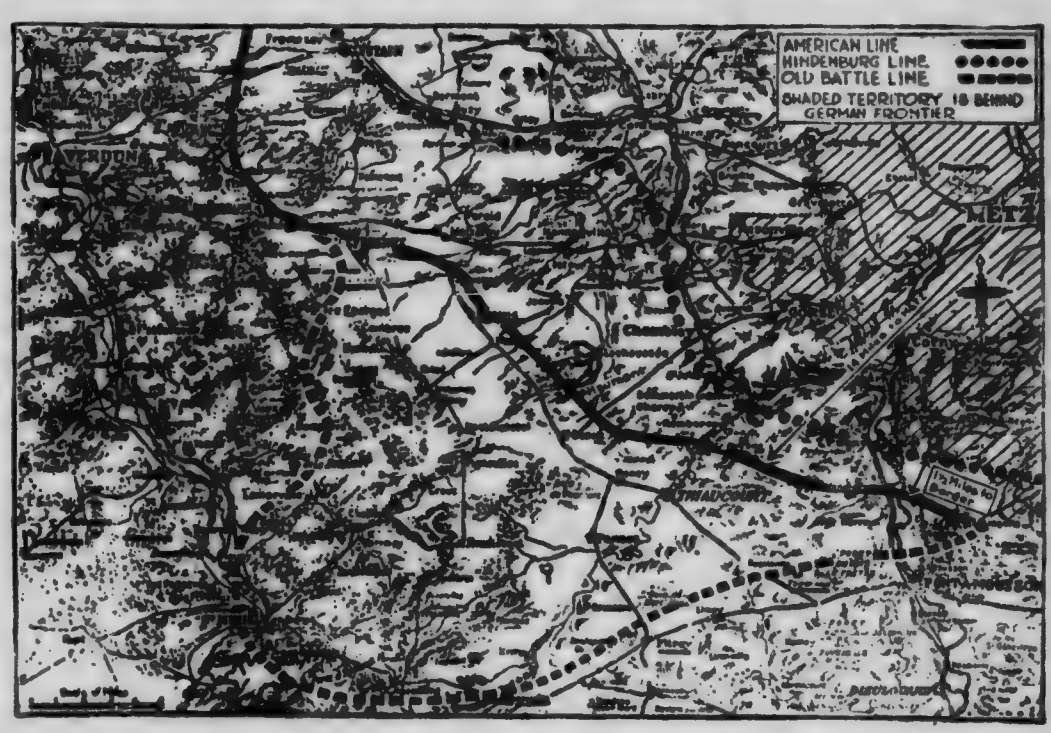
Map Showing Part of the Italian Irredenta

in killed and wounded of the Canadian regiments. They ranked in magnitude with the depletion that came to the Australian and New Zealand armies in the fatal Gallipoli campaign. This year will be glorious forever in the annals of France because of the heroic defense at Verdun. That battle tested to the limit the offensive strength of the German machine and it was found lacking in power to pierce the superhuman defense of the heroic French forces under Pétain and Nivelle. Bulgaria entered the war on October 14, 1915, with a declaration of war against helpless Serbia. Greece, torn by internal dissensions, inclined first to one side, then to the other. The occupation of Saloníka by French and British expeditionary forces finally swung the archipelago to the Allies. A British Mesopotamian force under General Townshend, poorly equipped and unsupported, was cut off in Kut-el-Amara and surrendered to the Turks on April 29, 1916. The Italian forces under General Cadorna made a sensational advance terminating in the capture of Gorizia. Portugal entered the war on the side of the Allies after it had refused to give up to Germany several German ships that had been interned in Portuguese ports. An object lesson in German submarine possibilities was given America when the Deutschland, a super-submarine cargo vessel, arrived in Baltimore, Maryland, on July 9, 1916. The Deutschland later was converted into a naval submarine and re-visited American shores, sinking a number of merchant ves-



THE LAST DESPERATE DRIVES OF THE GERMANS

sels. It was one of the German submarine fleet surrendered to the Allies in November, 1918. Russia proved itself to be a military ineffective. German armies under von Mackensen and von Hindenburg occupied Warsaw, Brest-Litovsk, Lutsk and Grodno. Grand Duke Nicholas was removed from the command of the Russian armies and Czar Nicholas assumed command. Germany's pretensions to sea power ended with the battle of Jutland, May 31, 1916, when its High Seas fleet fled after a running fight with British



THE GREAT ST. MIHIEL SALIENT OBLITERATED BY THE AMERICANS, SEPTEMBER, 1918

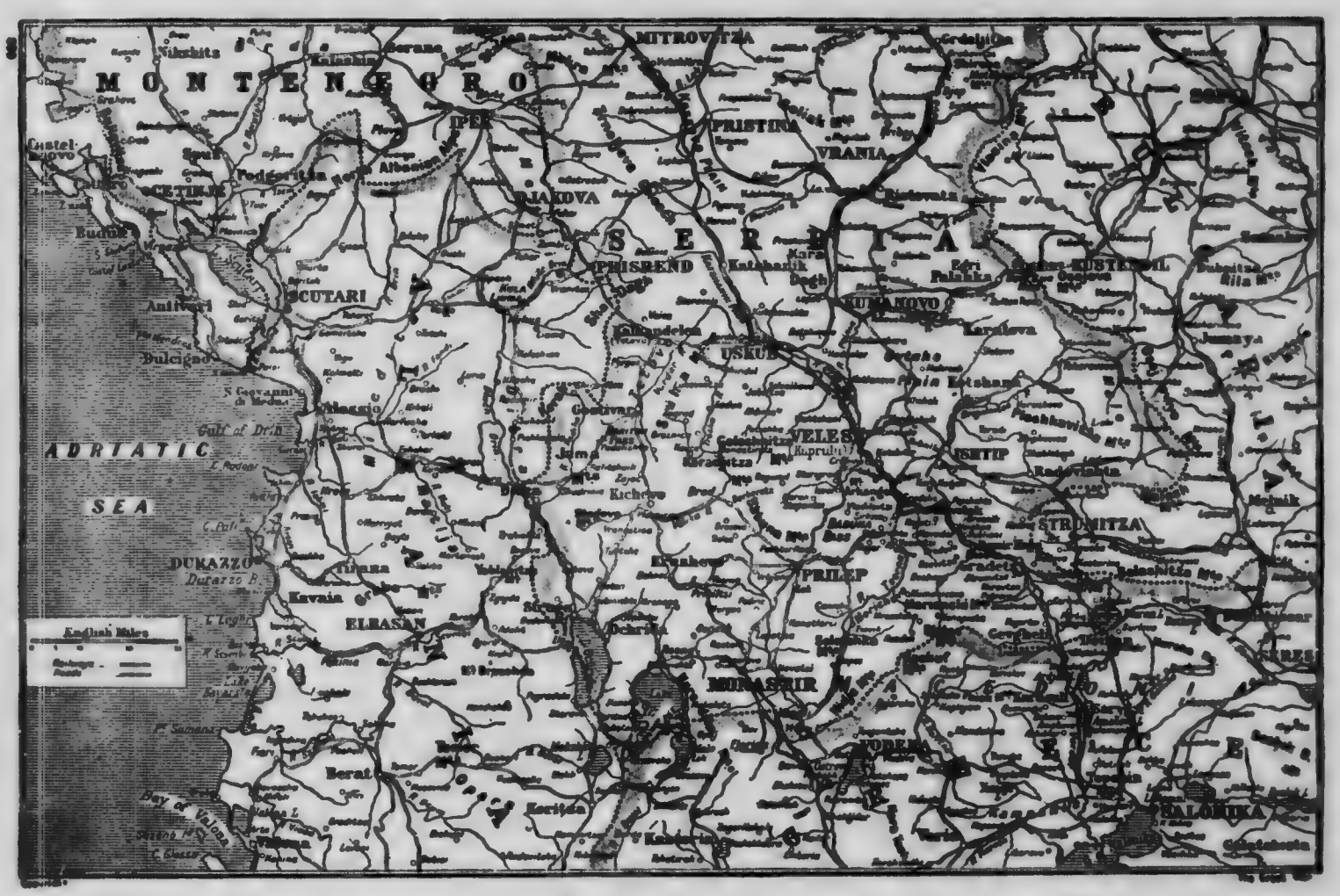
cruisers and destroyers. Never, thereafter, during the war did the German ships venture out of the Bight of Helgoland.

Third Year of War. This year was marked by two dramatic episodes. The first of these was the sudden entrance and the equally sudden exit of Roumania as a factor in the World War.

The second was the appearance of the United States, which became the deciding factor in the war.

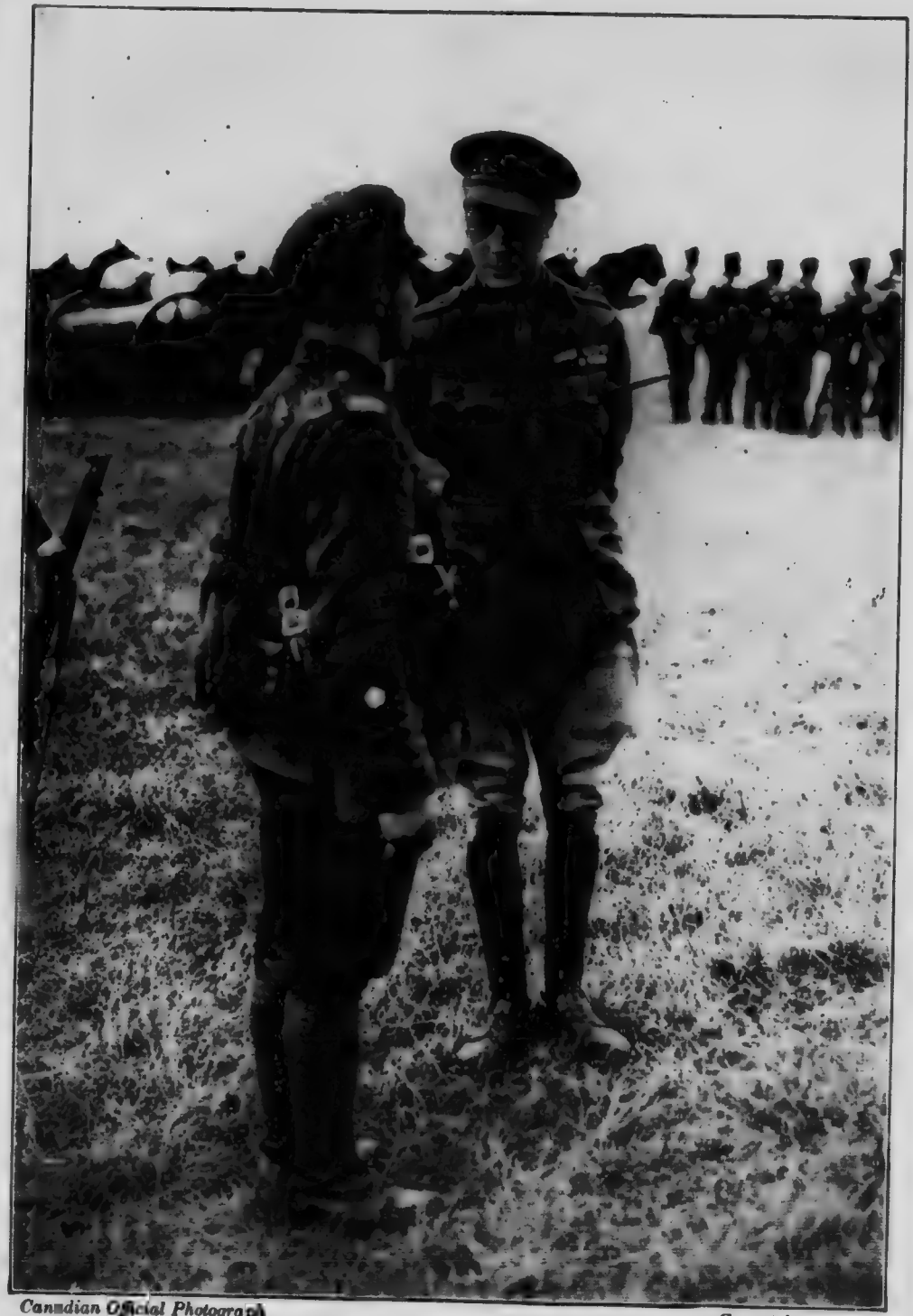
Roumania created enthusiasm in Allied countries when it declared war on Austria-Hungary August 27th. A sudden descent by a Roumanian army into Transylvania on August 30th was hailed as the harbinger of further successes. These hopes were turned to ashes when von Mackensen headed an irresistible German and Austrian rush which fairly inundated Roumania. The retreat from Transylvania by the Roumanians was turned into a rout. Bulgarian forces invaded the Dobrudja region of Roumania and, on November 28th, the seat of the Roumanian Government was transferred from Bucharest, the capital, to Jassy. Roumania ceased to be a factor in the war on December 6th, when Bucharest fell to von Mackensen. Emperor Franz Josef of Austria-Hungary died on November 22d, while Austrian hopes were at their highest.

America's appearance as a belligerent was forecast on January 31, 1917, when Germany announced its intention of sinking all vessels in a blockade zone around the British Isles. Count von Bernstorff was handed his passports on February 3d, and on April 2d President Wilson, in a remarkable address to Congress, advised a declaration of war by the United States against Germany. This was consummated by a formal vote of Congress de-



TWELVE MILES EAST OF MONASTIR BEGAN THE ALLIED DRIVE THAT DEFEATED BULGARIA

Twelve Miles East of Monastir Began the Allied Drive that Defeated Bulgaria



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H. R. H. THE PRINCE OF WALES

Inspecting a Canadian Machine Gun Battalion on the Valenciennes front. The Prince is seen talking to a company sergeant-major.

European War

claring war on April 6th. This action by America was followed by the organization of a Council of National Defense. Under this body the resources of the nation were mobilized. The council was later virtually abandoned as an organizing factor, its functions going to the War Industries Board, presided over by Bernard Baruch; the Fuel Administration, under Dr. Harry A. Garfield; the War Trade Board, with Vance C. McCormick at its head; and other governmental bodies. George Creel headed the Committee on Public Information. Conscription was decided upon as the foundation of America's war-making policy, and the training of officers and privates in great training camps was commenced. Great shipping and aircraft programs were formulated and the nation as a whole was placed upon a war footing. The Russian revolution, beginning in bread riots in Petrograd, spread throughout that country, with the result that Russia disappeared as one of the Entente Allies.

Last Months of War, from August 1, 1917, to November 11, 1918. America's might and efficiency were revealed in the speed and thoroughness with which her military, naval and civilian resources were mobilized and thrown into the conflict. Under the supervision of the Chief of Staff, two million American soldiers received the final touches in their military training and were transported safely overseas. They became the decisive factor in the war during the summer and fall of 1918. To their glory be it recorded they never retreated. They fought victorious battles at Cantigny, Château-Thierry, Belleau Wood, St. Mihiel, Siecheprey, Boureches Wood, the Argonne, Stenay, and had reached historic Sedan when the armistice went into effect on November 11.

Italy suffered a severe reverse beginning, October 24, 1917, when the Germans rushed through a portion of the Italian army that had been honeycombed with pro-German Socialistic propaganda. Later on the Italians turned the tables on the Austrians with a terrific drive commanded by General Diaz, which resulted in the capture of nearly half a million prisoners and forced Austria-Hungary out of the war.

Canada again emblazoned its name in history through the capture of Passchendaele on November 6, 1917; and a year later it was the irresistible Canadians who took Mons, the last stronghold to be wrested from the Germans before the armistice.

On the Russian and Roumanian fronts Generals Brusiloff and Korniloff for a time achieved success, but the Bolsheviki gospel reaching the men in the ranks they threw down their guns and refused to fight. In November Lenine took control of Russian affairs and a peace treaty with the Central Powers was signed in March, 1918. Roumania also concluded a peace treaty. Czar Nicholas, who, after the revolution, had been interned in Tsarskoe-Selo and later at Yekaterinberg, was executed July 20, 1918, by order of the Bolsheviki Ural Regional Council.

The British Mesopotamian forces advanced into Palestine and Mesopotamia, destroying the Turkish army. General Stanley Maude, the leader of the expedition, died in Mesopotamia November 18, 1917. General Allenby, commanding British and Arabian forces, routed and destroyed three Turkish armies in Palestine, capturing Jerusalem December 8, 1917. Damascus fell to the British in October, 1918.

The turning point of the war came on March 29, 1918, when General Foch was chosen Commander-in-Chief of all the Allied forces. This followed Germany's great drive from Arras to La Fere. Successive German thrusts yielded territory; but Foch, patiently biding his time, elected to halt the German drive with Americans. The Marines of the United States forces were given the place of honor, and at Château-Thierry the counter thrust of Foch was commenced by a complete defeat of the Prussian Guard and other crack German regiments by the untried soldiers of America. A little later the great salient of St. Mihiel, established by the Germans in 1914, was wiped out by American troops.

The 'Yanks' were coming at the rate of 200,000 men a month, and they threw themselves into the conflict with a vigor that inspired the Allies and dismayed the enemy. It was the end of the German advance, the beginning of the humiliating defeat that was to be visited upon the Teuton warmakers.

Said President Wilson, in his address to Congress December 2, 1918, prior to sailing for Europe to take part in the Peace Conference: 'What we all thank God for with deepest gratitude is that our men went in force into the line of battle just at the critical moment, when the whole fate of the world seemed to hang in the balance, and threw their fresh strength into the ranks of freedom in time to turn the whole tide and sweep of the fateful struggle—turn it once for all, so that henceforth it was back, back, back for their enemies, always back, never again forward!'

From Château-Thierry to the armistice of November 11 was only a short space of

GERMAN RETIREMENT UNDER ARMISTICE OF NOVEMBER 11, 1918

Dotted area, invaded territory of Belgium, France, Luxembourg and Alsace-Lorraine; area in small squares, part of Germany west of the Rhine; lightly shaded area to east of Rhine, neutral zone; black semi-circles, bridge-heads of thirty kilometers radius to be occupied by Allied armies.

time, but in it was compressed the humiliation of arrogant Teutonic imperialism, the destruction of militaristic aristocracy, and the liberation of the world.

The Armistice. Bulgaria surrendered to General d'Esperey, the Allied commander, on September 29, agreeing to evacuate all foreign territory; to demobilize her army and surrender all means of transport to the Allies; to surrender her boats and control of navigation on the Danube and concede to the Allies free passage through Bulgaria for the development of military operations.

The armistice with Turkey, signed on October 31, provided for the opening of the Dardanelles and Bosporus; access to the Black Sea; Allied occupation of the Dardanelles and Bosporus forts; surrender of all war vessels in Turkish waters; withdrawal of Turkish troops from Persia; surrender of all garrisons in Hedjas; Assir, Yemen, Syria and Mesopotamia; release of Allied prisoners.

The armistice with Austria-Hungary, signed November 3, provided for the demobilization of the Austro-Hungarian army; evacuation of all territories invaded by Austria-Hungary and a further withdrawal to a line indicated by the Allied commander; surrender of 15 Austrian submarines and all German submarines in Austrian waters; surrender of 3 battleships, 3 light cruisers, 9 destroyers, 12 torpedo boats, 1 mine layer, 6 Danube monitors; all other ships to be disarmed.

Germany—proud, imperial Germany—met the greatest humiliation of all the Teutonic Allies when the Kaiser and the German High Command were brought to their knees. Thirty-five clauses, the most severe and drastic ever demanded from a great power, were included in the armistice agreement which took effect at eleven o'clock on November 11, 1918. Among the conditions were: evacuation of invaded countries, including Alsace-Lorraine; surrender of 5000 guns, 25,000 machine guns, 3000 minenwerfers and 1700 airplanes; evacuation of left bank of Rhine; reservation of neutral zone on right bank of Rhine; surrender of 5000 locomotives, 150,000 wagons and 5000 motor lorries; upkeep of troops in Rhine land to be charged to the German government; return of all prisoners; renunciation of Bucharest and Brest-Litovsk treaties; surrender of 6 battle cruisers, 10 battleships, 8 light cruisers, 50 destroyers; all other ships to be disarmed; surrender of all German submarines; freedom of access to the Baltic; all naval aircraft to be concentrated and immobilized; all Black Sea ports to be evacuated by Germany; all Russian warships seized by Germany to be surrendered; no transfers of German merchant shipping to any neutral flag.

(See also articles under Chateau-Thierry, St. Mihiel, Somme, Marne, Ypres, Gallipoli, Palestine, Tannenberg, Jutland, Verdun, Neuve Chapelle, etc.; Foch, Pershing, Haig, Dias, Currie, Sims, Benson, etc.; Submarines, Aeronautics, and various countries of the world.)

The Peace Congress. The world's greatest war was followed by the world's greatest peace conference, which opened at three o'clock on the afternoon of January 18, 1919, at the French Foreign Office on the Quai d'Orsay, Paris. Thirty-two nations and dominions took part. The authorized delegates numbered sixty-six, distributed as follows:

Five delegates each: The United States, Great Britain, France, Italy, Japan.

Three delegates each: Brazil, Belgium, Serbia.

Two delegates each: Canada, Australia, South Africa, India, Greece, Poland, Roumania, China, Hedjas.

One delegate each: Portugal, Montenegro, Siam, Cuba, New Zealand, Panama, Haiti, Honduras, Nicaragua, Guatemala, San Domingo, Uruguay, Peru and Bolivia.

The representatives of the United States were President Wilson, Robert Lansing, Secretary of State; Henry White, former ambassador to France and Italy; Edward M. House, and General Tasker H. Bliss, representative of the American army with the supreme war council at Versailles.

Georges Clemenceau, Premier of France, was chosen permanent chairman of the conference. The public was not admitted to the meetings of the congress, but from time to time communiqués were issued, announcing the progress of the discussions. Among important matters which the congress deliberated upon were: the establishment of a Society of Nations (President Wilson's chief reason for visiting Europe); the re-making of the French and Italian and other boundary lines; the disposal of the former German colonies and Turkish territory in Asia Minor, to be governed under so-called 'mandatories' of one or other of the great powers; the question of Russia; the establishment of the new states of Poland and Czecho-Slovakia and Jugo-Slavia; the punishment of those who started the war; the reparation to be made by Germany. The peace treaty was signed at Versailles June 28, 1919. (See *Treaty of Peace, League of Nations.*)

Summarized Chronology of the War

1914

June

28.—Assassination of Archduke Francis Ferdinand, heir to throne of Austria-Hungary, and his wife at Sarajevo, Bosnia.

July

28.—Austria-Hungary declares war on Serbia.

29.—Russian mobilization ordered.

August

1.—Germany declares war on Russia.

1.—France orderes mobilization.

2.—Germany demands free passage through Belgium.

3.—Germany declares war on France.

3.—Belgium rejects Germany's demand. Troops under Gen. Von Kluck cross border. Halted at Liége.

4.—Great Britain at war with Germany. Kitchener becomes Secretary of War.

5.—President Wilson tenders good offices of United States in interests of peace.

6.—Austria-Hungary at war with Russia.

7.—French forces invade Alsace. Gen. Joffre in supreme command of French army.

7.—Montenegro at war with Austria.

7.—Great Britain's Expeditionary Force lands at Ostend, Calais and Dunkirk.

8.—British seize German Togoland.

8.—Serbia at war with Germany.

8.—Portugal announces readiness to stand by alliance with England.

11.—German cruisers *Goeben* and *Breslau* enter Dardanelles and are purchased by Turkey.

12.—Great Britain at war with Austria-Hungary.

12.—Montenegro at war with Germany.

17.—Belgian capital removed from Brussels to Antwerp.

19.—Canadian Parliament authorizes raising expeditionary force.

20.—Germans occupy Brussels.

23.—Japan at war with Germany. Begins attack on Tsingtau.

24.—Germany enters France near Lille.

25.—Austria at war with Japan.

26.—Louvain sacked and burned by Germans. Viviani becomes premier of France.

28.—British fleet sinks three German cruisers and two destroyers off Helgoland.

28.—Austria declares war on Belgium.

29.—Russians invest Konigsberg, East Prussia. New Zealanders seize German Samoa.

30.—Amiens occupied by Germans.

31.—Russian army of invasion in East Prussia defeated at Tannenberg by Germans under Von Hindenburg.

31.—St. Petersburg changed to Petrograd by imperial decree.

September

3.—Paris placed in state of siege; government transferred to Bordeaux.

3.—Lemberg, Gallicia, occupied by Russians.

4.—Germans occupy Rheims.

6-10.—Battle of Marne. Von Kluck is beaten by Gen. Joffre, and the German army retreats from Paris to the Soissons-Rheims line.

10.—*Emden*, German cruiser, carries out raids in Bay of Bengal.

14.—French reoccupy Amiens and Rheims.

19.—British forces begin operations in Southwest Africa.

20.—Rheims cathedral shelled by Germans.

24.—Allies occupy Peronne.

25.—Australians seize German New Guinea.

28.—Anglo-French forces invade German colony of Kamerun.

29.—Antwerp bombardment begins.

October

2.—British Admiralty announces intention to mine North Sea areas.

6.—Japan seizes Marshall Islands in Pacific.

9.—Antwerp surrenders to Germans. Government removed to Ostend.

13.—British occupy Ypres.

14.—Canadian Expeditionary Force of 32,000 men lands at Plymouth.

15.—Germans occupy Ostend. Belgian government removed to Havre, France.

November

1.—*Monmouth* and *Good Hope*, British cruisers, are sunk by German squadron off Chile under command of Admiral Von Spee.

5.—Great Britain and France declare war on Turkey.

5.—Cyprus annexed by Great Britain.

7.—German garrison of Tsingtau surrenders to Japanese.

9.—*Emden*, German cruiser, which had carried out raiding operations for two months, is destroyed by Australian cruiser *Sydney* off the Cocos Islands, southwest of Java.

16.—Prohibition of sale of intoxicants in Russia enforced.

27.—Czernowitz, capital of Bukowina, captured by Russians.

December

2.—Belgrade occupied by Austrians.

3.—Cracow bombarded by Russians.

8.—Off the Falkland Islands, British squadron under command of Rear-Admiral Sturdee, sinks three of the German cruisers which had destroyed the *Good Hope* and *Monmouth* on Nov. 1. The *Dresden* escapes.

14.—Austrians evacuate Belgrade.

16.—German squadron bombards Hartlepool, Scarborough and Whitby on east coast of England.

23.—Siege of Cracow raised. Russians retire.

1915

January

24.—British fleet puts to flight a German squadron in North Sea and sinks the battle cruiser *Blücher*.

28.—American bark, *William P. Frye*, sunk by German cruiser in South Atlantic.

February

10.—Russians defeated by Germans in Battle of Masurian Lakes.

18.—German submarine "blockade" of British Isles begins.

25.—Allied fleet destroys outer forts of Dardanelles.

March

2.—Allied troops land at Kum-Kale, on Asiatic side of Dardanelles.

10.—British take Neuve Chapelle in Flanders battle.

14.—*Dresden*, German raiding cruiser, is sunk by British squadron off the Chilean coast.

22.—Austrian fortress of Przemysl surrenders to Russians.

April

22.—Poison gas first used by Germans in attack on Canadians at Ypres, Belgium.

May

1.—American steamer *Gulflight* torpedoed off Scilly Isles by German submarine; 3 lives lost.

2.—British South African troops under General Botha capture Otymbingue, German Southwest Africa.

7.—Germans capture Libau, Russian Baltic port.

7.—*Lusitania*, Cunard liner, sunk by German submarine off Kinsale Head, Irish coast, with loss of 1152 lives; 102 Americans.

23.—Italy declares war on Austria-Hungary and begins invasion on a 60-mile front.

24.—American steamer *Nebraskan* torpedoed by German submarine off Irish coast, but reaches Liverpool in safety.

31.—German Zeppelins bombard suburbs of London.

June

1.—Germany apologizes for attack on *Gulflight* and offers reparation.

3.—Austrians recapture Przemysl.

3.—British forces operating on Tigris capture Kut-el-Amara.

4-6.—German aircraft bombs English towns.

7.—Bryan, U. S. Secretary of State, resigns.

15.—Allied aircraft bombs Karlsruhe, Baden, in retaliation.

22.—Lemberg recaptured by Austrians.

26.—Montenegrins enter Scutari, Albania.

July

9.—German Southwest Africa surrenders to British South African troops under Gen. Botha.

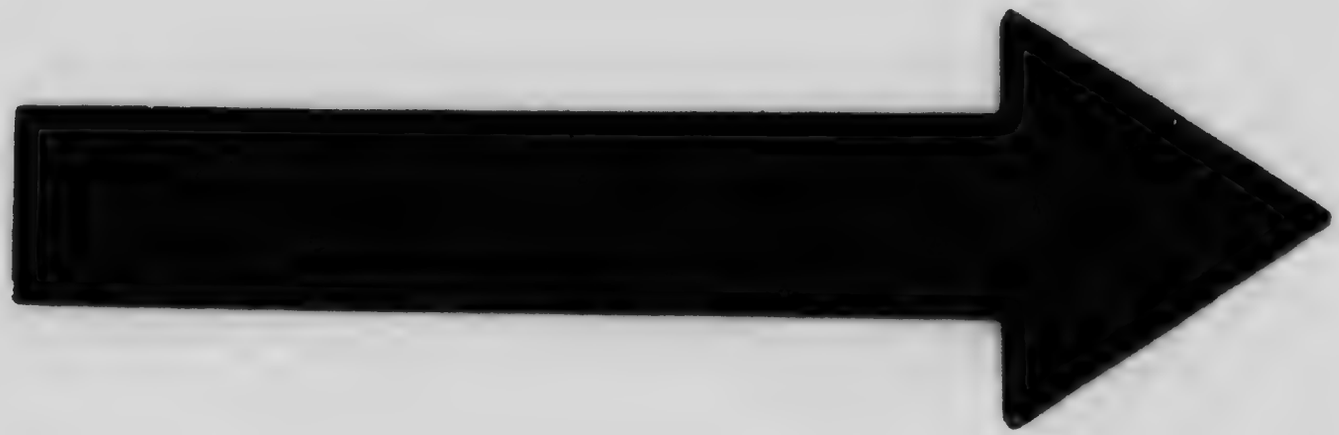
25.—American steamer *Leelanaw*, Archangel to Belfast with flax, torpedoed off Scotland.

31.—Baden bombarded by French aircraft.

August

5.—Warsaw captured by Germans.

6.—Ivangorod occupied by Austrians.



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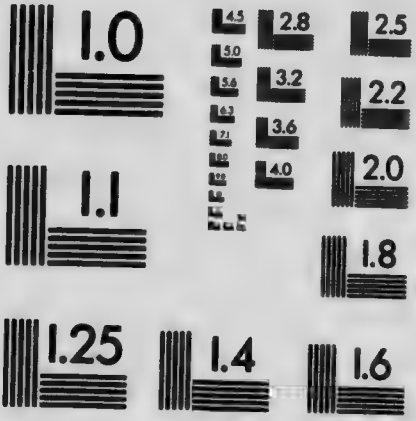

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6.—Gallipoli Peninsula campaign enters a second stage with the debarkation of a new force of British troops in Suvla Bay, on the west coast of the peninsula.

8.—Russians defeat German fleet of 9 battleships and 12 cruisers at entrance of Gulf of Riga.

19.—*Arabic*, White Star liner, sunk by submarine off Fastnet; 44 lives lost; 2 Americans.

25.—Brest-Litovsk, Russian fortress, captured by Austro-Germans.

28.—Italians reach Cima Cista, northeast of Trent.

30.—British submarine attacks Constantinople and damages the Galata Bridge.

31.—Lutsk, Russian fortress, captured by Austrians.

September

2.—Grodno, Russian fortress, occupied by Germans.

6.—Czar Nicholas of Russia assumes command of Russian armies. Grand Duke Nicholas is transferred to the Caucasus.

15.—Pinsk occupied by Germans.

18.—Vilna evacuated by Russia.

24.—Lutsk recaptured by Russians.

25.—Allies open offensive on western front and occupy Lens.

27.—Lutsk again falls to Germans.

October

5.—Greece becomes political storm center. Franco-British force lands at Salonika and Greek ministry resigns.

9.—Belgrade again occupied by Austro-Germans.

11.—Zaimis, new Greek premier, announces policy of armed neutrality.

12.—Edith Cavell, English nurse, shot by Germans for aiding British prisoners to escape from Belgium.

13.—London bombarded by Zeppelins; 35 persons killed; 114 injured.

14.—Bulgaria at war with Serbia.

14.—Italians capture Pregasina, on the Trentino frontier.

15.—Great Britain declares war on Bulgaria.

17.—France at war with Bulgaria.

18.—Bulgarians cut the Nish-Salonika railroad at Vranja.

19.—Italy and Russia at war with Bulgaria.

22.—Uskub occupied by Bulgarians.

28.—Pirot captured by Bulgarians.

29.—Briand becomes premier of France, succeeding Viviani.

November

5.—Nish, Serbian war capital, captured by Bulgarians.

9.—*Ancona*, Italian liner, torpedoed in Mediterranean.

17.—Anglo-French war council holds first meeting in Paris.

20.—Novibazar occupied by German troops.

22.—Ctesiphon, near Bagdad, captured by British forces in Asia Minor.

23.—Italians drive Austrians from positions on Carso Plateau.

24.—Serbian government transferred to Scutari, Albania.

December

1.—British Mesopotamian forces retire to Kut-el-Amara.

2.—Monastir evacuated by Serbians.

4.—Henry Ford, with large party of peace advocates, sails for Europe on chartered steamer *Oscar II*, with the object of ending the war.

13.—Serbia in hands of enemy, Allied forces abandoning last positions and retiring across Greek frontier.

15.—Gen. Sir Douglas Haig succeeds Field Marshal Sir John French as Commander-in-Chief of British forces in France.

20.—Dardanelles expedition ends; British troops begin withdrawal from positions on Suvla Bay and Gallipoli Peninsula.

22.—Henry Ford leaves his peace party at Christiania and returns to the United States.

1916

January

11.—Greek island of Corfu occupied by French.

13.—Cettinje, capital of Montenegro, occupied by Austrians.

23.—Scutari, Albania, taken by Austrians.

29-31.—German Zeppelins bomb Paris and towns in England.

February

1.—*Appam*, British liner, is brought into Norfolk, Va., by German prize crew.

10.—British conscription law goes into effect.

16.—Erzerum, in Turkish Armenia, captured by Russians under Grand Duke Nicholas.

19.—Kamerun, German colony in Africa, conquered by British forces.
21.—Battle of Verdun begins. Germans take Haumont.
25.—Fort Douaumont falls to Germans in Verdun battle.
27.—Durazzo, Albania, occupied by Austrians.

March

5.—*Moewe*, German raider, reaches home port after a cruise of several months.
9.—Germany declares war on Portugal on the latter's refusal to give up seized ships.
15.—Austria-Hungary at war with Portugal.
24.—*Sussex*, French cross-channel steamer, with many Americans aboard, sunk by submarine off Dieppe. No Americans lost.
31.—Melancourt taken by Germans in Verdun Battle.

April

18.—Trebizond, Turkish Black Sea port, captured by Russians.
19.—President Wilson publicly warns Germany not to pursue submarine policy.
20.—Russian troops landed at Marseilles for service on French front.
24.—Irish rebellion begins in Dublin. Republic declared. Patrick Pearse announced as first president.
29.—British force of 9000 men, under Gen. Townshend, besieged in Kut-el-Amara, surrenders to Turks.
30.—Irish rebellion ends with unconditional surrender of Pearse and other leaders, who are tried by court-martial and executed.

May

8.—*Cymric*, White Star liner, torpedoed off Irish coast.
14.—Italian positions penetrated by Austrians.
15.—Vimy Ridge gained by British.
26.—Bulgarians invade Greece and occupy forts on the Struma.
31.—Jutland naval battle; British and German fleets engaged; heavy losses on both sides.

June

5.—Kitchener, British Secretary of War, loses his life when the cruiser *Hampshire*, on which he was voyaging to Russia, is sunk off the Orkney Islands, Scotland.
6.—Germans capture Fort Vaux in Verdun attack.
8.—Lutsk, Russian fortress, recaptured from Germans.
17.—Czernowitz, capital of Bukowina, occupied by Russians.
21.—Allies demand Greek demobilisation.
27.—King Constantine orders demobilization of Greek army.
28.—Italians storm Monte Trappola, in the Trentino district.

July

1.—British and French attack north and south of the Somme.
9.—*Deutschland*, German submarine freight boat, lands at Baltimore, Md.
14.—British penetrate German second line, using cavalry.
15.—Longueval captured by British.
25.—Pozières occupied by British.
30.—British and French advance between Delville Wood and the Somme.

August

3.—French recapture Fleury.
9.—Italians enter Goritzia.
10.—Stanislau occupied by Russians.
25.—Kavala, Greek seaport town, taken by Bulgarians.
27.—Roumania declares war on Austria-Hungary.
28.—Italy at war with Germany.
28.—Germany at war with Roumania.
30.—Roumanians advance into Transylvania.
31.—Bulgaria at war with Roumania. Turkey at war with Roumania.

September

2.—Bulgarian forces invade Roumania along the Dobrudja frontier.
13.—Italians defeat Austrians on the Carso.
15.—British capture Flers, Courcelette, and other German positions on western front, using 'tanks.'
26.—Combles and Thiepval captured by British and French.
29.—Roumanians begin retreat from Transylvania.

October

24.—Fort Douaumont recaptured by French.

November

1.—*Deutschland*, German merchant submarine, arrives at New London, Conn., on second voyage.
2.—Fort Vaux evacuated by Germans.
7.—Woodrow Wilson re-elected President of the United States.
13.—British advance along the Ancre.

19.—Monastir evacuated by Bulgarians and Germans.
21.—*Britannic*, mammoth British hospital ship, sunk by mine in Ægean Sea.
22.—Emperor Franz Josef, of Austria-Hungary, dies. Succeeded by Charles I.
23.—German warships bombard English coast.
28.—Roumanian government is transferred to Jassy.
29.—*Minnewaska*, Atlantic transport liner, sunk by mine in Mediterranean.

December

1.—Allied troops enter Athens to insist upon surrender of Greek arms and munitions.
6.—Bucharest, capital of Roumania, captured by Austro-Germans.
7.—David Lloyd George succeeds Asquith as premier of England.
15.—French complete recapture of ground taken by Germans in Verdun battle.
18.—President Wilson makes peace overtures to belligerents.
26.—Germany replies to President's note and suggests a peace conference.
30.—French government on behalf of Entente Allies replies to President Wilson's note and refuses to discuss peace till Germany agrees to give 'restitution, reparation and guarantees.'

1917

January

1.—Turkey declares its independence of suzerainty of European powers.
1.—*Ivernia*, Cunard liner, is sunk in Mediterranean.
22.—President Wilson suggests to the belligerents a 'peace without victory.'
31.—Germany announces intention of sinking all vessels in war zone around British Isles.

February

3.—United States severs diplomatic relations with Germany. Count Von Bernstorff is handed his passports.
7.—*California*, Anchor liner, is sunk off Irish coast.
13.—*Afric*, White Star liner, sunk by submarine.
17.—British troops on the Ancre capture German positions.
25.—*Laconia*, Cunard liner, sunk off Irish coast.
26.—Kut-el-Amara recaptured from Turks by new British Mesopotamian expedition under command of Gen. Sir Stanley Maude.
28.—United States government makes public a communication from Germany to Mexico proposing an alliance, and offering as a reward the return of Mexico's lost territory in Texas, New Mexico and Arizona.
28.—Submarine campaign of Germans results in the sinking of 134 vessels during February.

March

3.—British advance on Bapaume.
3.—Mexico denies having received an offer from Germany suggesting an alliance.
8.—Count Ferdinand von Zeppelin dies.
10.—Russian Czar suspends sittings of the Duma.
11.—Bagdad captured by British force under Gen. Maude.
11.—Revolutionary movement starts in Petrograd.
14.—China breaks with Germany.
15.—Czar Nicholas abdicates. Prince Lvoff heads new cabinet.
17.—Bapaume falls to British. Roye and Lassigny occupied by French.
18.—Peronne, Chaulnes, Nesle and Noyon evacuated by Germans, who retire on an 85-mile front.
18.—*City of Memphis*, *Illinois*, and *Vigilancia*, American ships, torpedoed.
19.—Alexander Ribot becomes French premier, succeeding Briand.
21.—*Healdton*, American ship, bound from Philadelphia to Rotterdam, sunk without warning: 21 men lost.
26-31.—British advance on Cambrai.

April

1.—*Aztec*, American armed ship, sunk in submarine zone.
5.—*Missourian*, American steamer, sunk in Mediterranean.
6.—United States declares war on Germany.
7.—Cuba and Panama at war with Germany.
8.—Austria-Hungary breaks with United States.
9.—Germans retreat before British on long front.
9.—Bolivia breaks with Germany.
13.—Vimy, Givenchy, Bailleul and positions about Lens taken by Canadians.
20.—Turkey breaks with United States.

May

9.—Liberia breaks with Germany.

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PRESIDENT WILSON SIGNING THE PEACE TREATY—A HISTORIC PICTURE

This photo was brought to America by the British dirigible, R-34, the first airship to cross the Atlantic. It shows the historic scene in the Hall of Mirrors at Versailles at the signing of the Peace Treaty. President Wilson sits at the table in front of the third mirror from left. Near him are seated Clemenceau, Lloyd George, General Bliss, Colonel House and Pichon

European War

11.—Russian Council of Workmen's and Soldiers' Delegates demands peace conference.
15.—Gen. Petain succeeds Gen. Nivelle as Commander-in-Chief of French armies. Gen. Foch is appointed Chief of Staff.
16.—Bullecourt captured by British in the Arras battles.
17.—Honduras breaks with Germany.
18.—Conscription bill signed by President Wilson.
19.—Nicaragua breaks with Germany.
22-26.—Italians advance on the Carso.

June

4.—Senator Root arrives in Russia at head of commission appointed by President.
5.—Registration day for new draft army in United States.
7.—Messines-Wytschaete ridge in English hands.
8.—Gen. Pershing, Commander-in-Chief of American expeditionary force, arrives in England en route to France.
18.—Haiti breaks with Germany.

July

1.—Russians begin offensive in Gallicia, Kerensky, minister of war, leading in person.
3.—American expeditionary force arrives in France.
6.—Canadian House of Commons passes Compulsory Military Service Bill.
12.—King Constantine of Greece abdicates in favor of his second son, Alexander.
14.—Bethmann-Hollweg, German Chancellor, resigns; succeeded by Dr. Georg Michaelis.
16-23.—Retreat of Russians on a front of 155 miles.
20.—Alexander Kerensky becomes Russian premier, succeeding Lvoff.
20.—Drawing of draft numbers for American conscript army begins.
22.—Siam at war with Germany and Austria.
24.—Austro-Germans retake Stanislau.
31.—Franco-British attack penetrates German lines on a 20-mile front.

August

1.—Pope Benedict XV makes plea for peace on a basis of no annexation, no indemnity.
3.—Czernowitz captured by Austro-Germans.
7.—Liberia at war with Germany.
8.—Canadian Conscription Bill passes its third reading in Senate.
14.—China at war with Germany and Austria-Hungary.

15.—St. Quentin Cathedral destroyed by Germans.
15.—Canadian troops capture Hill 70, dominating Lens.
19.—Italians cross the Isonzo and take Austrian positions.
28.—Pope Benedict's peace plea rejected by President Wilson.

September

3.—Riga captured by Germans.
5.—New American National Army begins to assemble in the different cantonments.
7.—*Minnehaha*, Atlantic transport liner, sunk off Irish coast.
12.—Argentine dismisses Von Luxburg, German minister, on charges of improper conduct made public by United States government.
14.—Paul Painlevé becomes French premier, succeeding Ribot.
16.—Russia proclaimed a republic by Kerensky.
20.—Costa Rica breaks with Germany.
21.—Gen. Tasker H. Bliss named Chief of Staff of the United States Army.
25.—Guynemer, famous French flier, killed.
26.—Zonnebeke, Polygon Wood and Tower Hamlets, east of Ypres, taken by British.
28.—William D. Haywood, secretary, and 100 members of the Industrial Workers of the World arrested for sedition.
29.—Turkish Mesopotamian army, under Ahmed Bey, captured by British.

October

6.—Peru and Uruguay break with Germany.
9.—Poelcapelle and other German positions captured in Franco-British attack.
12-16.—Oesel and Dago, Russian islands in Gulf of Riga, captured by Germans.
17.—*Antilles*, American transport, westbound from France, sunk by submarine; 67 lost.
18.—Moon Island, in the Gulf of Riga, taken by Germans.
23.—American troops in France fire their first shot in trench warfare.
23.—French advance northeast of Soissons.
24.—Austro-Germans begin great offensive on Italian positions.
25.—Italians retreat across the Isonzo and evacuate the Bainsizza Plateau.
26.—Brazil at war with Germany.
27.—Goritzia recaptured by Austro-Germans.
30.—Michaelis, German Chancellor, resigns; succeeded by Count George F. von Hertling.

This photo was brought to America by the British dirigible, R-34, the first airship to cross the Atlantic. It shows the historic scene in the Hall of Mirrors at Versailles at the signing of the Peace Treaty. President Wilson sits at the table in front of the third mirror from left. Near him are seated Clemenceau, Lloyd George, General Bliss, Colonel House and Pichon

31.—Italians retreat to the Tagliamento.
31.—Beersheba, in Palestine, occupied by British.

November

1.—Germans abandon position on Chemin des Dames.
3.—Americans in trenches suffer 20 casualties in German attacks.
5.—Italians abandon Tagliamento line and retire on 93-mile front in the Carnic Alps.
6.—Passchendaele captured by Canadians.
6.—British Mesopotamian forces reach Tekrit, 100 miles northwest of Bagdad.
7.—The Russian Bolsheviki, led by Lenine and Trotzsky, seize Petrograd and depose Kerensky.
8.—Gen. Diaz succeeds Gen. Cadorna as Commander-in-Chief of Italian armies.
9.—Italians retreat to the Piave.
10.—Lenine becomes premier of Russia, succeeding Kerensky.
15.—Georges Clemenceau becomes premier of France, succeeding Painlevé.
18.—Major-General Maude, captor of Bagdad, dies in Mesopotamia.
21.—Ribecourt, Flesquières, Havrincourt, Marcoing and other German positions captured by British.
23.—Italians repulse Germans on the whole front from the Asiago Plateau to the Brenta River.
24.—Cambrai menaced by British, who approach within three miles, capturing Bourlon Wood.

December

1.—German East Africa reported completely conquered.
1.—Allies' Supreme War Council, representing the United States, France, Great Britain and Italy, holds first meeting at Versailles.
3.—Russian Bolsheviki arrange armistice with Germans.
5.—British retire from Bourlon Wood, Graincourt and other positions west of Cambrai.
6.—*Jacob Jones*, American destroyer, sunk by submarine in European waters.
6.—Steamer *Mont Blanc*, loaded with munitions, explodes in collision with the *Imo* in Halifax harbor; 1500 persons are killed.
7.—Finland declares independence.
8.—Jerusalem, held by the Turks for 673 years, surrenders to British, under Gen. Allenby.
8.—Ecuador breaks with Germany.
10.—Panama at war with Austria-Hungary.
11.—United States at war with Austria-Hungary.
15.—Armistice signed between Germany and Russia at Brest-Litovsk.
17.—Coalition government of Sir Robert Borden is returned and conscription confirmed in Canada.

1918

January

14.—Premier Clemenceau orders arrest of former Premier Caillaux on high treason charge.
19.—American troops take over sector northwest of Toul.
29.—Italians capture Monte di val Belle.

February

1.—Argentine Minister of War recalls military attachés from Berlin and Vienna.
6.—*Tuscania*, American transport, torpedoed off coast of Ireland; 101 lost.
22.—American troops in Chemin des Dames sector.
26.—British hospital ship, *Glenart Castle*, torpedoed.
27.—Japan proposes joint military operations with Allies in Siberia.

March

1.—Americans gain signal victory in salient north of Toul.
3.—Peace treaty between Bolshevik government of Russia and the Central Powers signed at Brest-Litovsk.
4.—Treaty signed between Germany and Finland.
5.—Roumania signs preliminary treaty of peace with Central Powers.
9.—Russian capital moved from Petrograd to Moscow.
14.—Russo-German peace treaty ratified by All-Russian Congress of Soviets at Moscow.
20.—President Wilson orders all Holland ships in American ports taken over.
21.—Germans begin great drive on 50-mile front from Arras to La Fere. Bombardment of Paris by German long-range gun from a distance of 76 miles.
24.—Peronne, Ham and Chauny evacuated by Allies.
25.—Bapaume and Nesle occupied by Germans.
29.—General Foch chosen Commander-in-Chief of all Allied forces.

April

5.—Japanese forces landed at Vladivostok.
9.—Second German drive begun in Flanders.
10.—First German drive halted before Amiens after maximum advance of 35 miles.
14.—United States Senator Stone, of Missouri, chairman of Committee on Foreign Relations, dies.
15.—Second German drive halted before Ypres, after maximum advance of 10 miles.
16.—Bolo Pasha, Levantine resident in Paris, executed for treason.
21.—Guatemala at war with Germany.
22.—Baron Von Richthofen, premier German flier, killed.
23.—British naval forces raid Zeebrugge in Belgium, German submarine base, and block channel.

May

7.—Nicaragua at war with Germany and her allies.
19.—Major Raoul Lufberry, famous American aviator, killed.
24.—Costa Rica at war with Germany and Austria-Hungary.
27.—Third German drive begins on Aisne-Marne front of 30 miles between Soissons and Rheims.
28.—Germans sweep on beyond the Chemin des Dames and cross the Vesle at Fismes.
28.—Cantigny taken by Americans in local attack.
29.—Soissons evacuated by French.
31.—Marne River crossed by Germans, who reach Château-Thierry, 40 miles from Paris.
31.—*President Lincoln*, American transport, sunk.

June

2.—Schooner *Edward H. Cole* torpedoed by submarine off American coast.
3-6.—American marines and regulars check advance of Germans at Château-Thierry and Neuilly after maximum advance of Germans of 32 miles. Beginning of American co-operation on major scale.
9-14.—German drive on Noyon-Montdidier front. Maximum advance, 5 miles.
15-24.—Austrian drive on Italian front ends in complete failure.
30.—American troops in France, in all departments of service, number 1,019,115.

July

1.—Vaux taken by Americans.
3.—Mohammed V, Sultan of Turkey, dies.
10.—Czecho-Slovaks, aided by Allies, take control of a long stretch of the Trans-Siberian Railway.
12.—Berat, Austrian base in Albania, captured by Italians.
15.—Haiti at war with Germany.
15.—Stonewall defense of Château-Thierry blocks new German drive on Paris.
16.—Nicholas Romanoff, ex-Czar of Russia, executed at Yekaterinburg.
17.—Lieut. Quentin Roosevelt, youngest son of ex-President Roosevelt, killed in aerial battle near Château-Thierry.
18.—French and Americans begin counter offensive on Marne-Aisne front.
19.—*San Diego*, United States cruiser, sunk off Fire Island.
20.—*Carpathia*, Cunard liner, used as transport, torpedoed off Irish coast. It was the *Carpathia* that saved most of the survivors of the *Titanic* in April, 1912.
20.—*Justicia*, giant liner used as troopship, is sunk off Irish coast.
21.—German submarine sinks three barges off Cape Cod.
23.—French take Oulchy-le-Château and drive the Germans back ten miles between the Aisne and the Marne.
30.—Allies astride the Ourcq; Germans in full retreat to the Vesle.

August

1.—Sergeant Joyce Kilmer, American poet and critic, aged 31, dies in battle.
2.—French troops recapture Soissons.
3.—President Wilson announces new policy regarding Russia and agrees to cooperate with Great Britain, France and Japan in sending forces to Murmansk, Archangel and Vladivostok.
3.—Allies sweep on between Soissons and Rheims, driving the enemy from his base at Fismes and capturing the entire Aisne-Vesle front.
7.—Franco-American troops cross the Vesle.
8.—New Allied drive begun by Field-Marshal Haig in Picardy, penetrating enemy front 14 miles.
10.—Montdidier recaptured.
13.—Lassigny *Massif* taken by French.
15.—Canadians capture Damery and Parvillers, northwest of Roye.
29.—Noyon and Bapaume fall in new Allied advance.

September

1.—Australians take Peronne.
1.—Americans fight for the first time on Belgian soil and capture Voormezeele.

European War

11.—Germans are driven back to the Hindenburg line which they held in November, 1917.

12.—Registration day for new draft army of men between 18 and 45 in the United States.

13.—Americans begin vigorous offense in St. Mihiel Sector on 40-mile front.

14.—St. Mihiel recaptured from Germans. General Pershing announces entire St. Mihiel salient erased, liberating more than 150 square miles of French territory which had been in German hands since 1914.

14.—Austro-Hungarian government invites belligerents to enter a confidential peace discussion.

15.—President Wilson refuses to discuss peace.

18.—John W. Davis, of West Virginia, appointed ambassador of the United States to Great Britain.

20.—Nazareth occupied by British forces in Palestine under Gen. Allenby.

23.—Bulgarian armies flee before combined attacks of British, Greek, Serbian, Italian and French.

25.—British take 40,000 prisoners in Palestine offensive.

26.—Strumnitza, Bulgaria, occupied by Allies.

27.—Franco-Americans in drive from Rheims to Verdun take 30,000 prisoners.

28.—Belgians attack enemy from Ypres to North Sea, gaining four miles.

29.—Bulgaria surrenders to General d'Esperey, the Allied commander.

30.—British-Belgian advance reaches Roulers.

October

1.—St. Quentin, cornerstone of Hindenburg line, captured.

1.—Damascus occupied by British in Palestine campaign.

2.—Lens evacuated by Germans.

3.—Albania cleared of Austrians by Italians.

3.—Hindenburg line pierced by British between Cambrai and St. Quentin.

4.—Ferdinand, king of Bulgaria, abdicates; Boris succeeds.

5.—Prince Maximilian, new German Chancellor, pleads with President Wilson to ask Allies for armistice.

6.—Beirut, chief seaport of Syria, evacuated by Turks, is entered by French ships.

7.—Berry-au-Bac taken by French.

8.—President Wilson asks whether German Chancellor speaks for people or war lords.

9.—Cambrai in Allied hands.

10.—*Leinster*, passenger steamer, sunk in Irish Channel by submarine; 490 lives lost; final German atrocity at sea.

11.—Americans advance through Argonne forest.

12.—German foreign secretary, Solf, says plea for armistice is made in name of German people; agrees to evacuate all foreign soil.

13.—Laon and La Fère abandoned by Germans.

13.—Grandpré captured by Americans after four days' battle.

14.—President Wilson refers Germans to General Foch for armistice terms.

15.—Durazzo, Austrian naval base in Albania, taken by Italians.

16.—Lille entered by British patrols.

17.—Ostend, German submarine base, taken by land and sea forces.

17.—Douai falls to Allies.

19.—Bruges and Zeebrugge taken by Belgians and British.

25.—Beginning of terrific Italian drive which nets 50,000 prisoners in five days.

31.—Turkey surrenders; armistice takes effect at noon; conditions include free passage of Dardanelles.

23.—Troops of the American Third Corps reach the ridge north of Banthéville.

27.—Americans north of Grandpre enter Bellejoyeuse.

November

1.—Cléry-le-Grand captured by American troops of First Army.

3.—Americans sweep ahead on 50-mile front above Verdun; enemy in full retreat.

3.—Austria surrenders, signing armistice with Italy at 3 P. M., after 500,000 prisoners had been taken.

4.—Americans advance beyond Stenay and strike at Sedan.

6.—Troops of First American Corps take Flabas, Raucourt, Haracourt, and Autrecourt.

7.—American Rainbow Division and parts of First Division enter suburbs of Sedan.

8.—Heights south of Sedan seized by Americans.

9.—Maubeuge captured by Allies.

9.—Kaiser Wilhelm abdicates and flees to Holland.

10.—Canadians take Mons in irresistible advance.

11.—Germany signs armistice.

1919

Jan. 18.—First meeting of Peace Conference at Paris.

June 28.—Treaty of peace with Germany signed at Versailles.

Europhen (ū'ro-fen), a yellow amorphous compound containing 27.6 per cent of iodine. In its action it is similar to iodoform, to which it is preferred by reason of its aromatic odor. In alcohol, chloroform, ether and oils it dissolves freely, but not in water.

Europium (ū-ro'pi-um), a chemical element which occurs in small quantities in the minerals of the 'rare earths.' It requires a complicated series of operations to separate it from the lanthanum, cerium, neodymium, gadolinium, and various elements of the 'rare earth' group with which it is associated. Its oxide Eu_2O_3 is obtained in the form of a powder of a faint pink color.

Eurotium (ū-ro'ti-um), a common mold which grows on a great variety of substances, especially dead herbs, bread, jellies, etc., and is known as the herbarium mold. The generic name used is *Aspergillus*.

Euryale (u-rai'a-lī), a genus of plants of the water-lily family of India and China, with large peltate leaves; the leaf stalks and calyces are covered with stiff prickles. The species *Euryale ferox* is sometimes grown in hothouses. The plant is said to have been in cultivation in China for 3000 years. The seeds are used for food in certain parts of India.

Eurydice (u-rid'i-sē), in Greek mythology, the wife of Orpheus (*q. v.*). She was the daughter of Nereus and Doris. While fleeing from Aristæus she died from the bite of a serpent. Orpheus followed her to the lower world and gained permission to take her back to earth on condition that he would not look behind him. Forgetting his promise he looked back and Eurydice vanished. Consult Vergil's 'Georgics' and Pope's 'Ode on St. Cecilia.'

Eusebius (ū-sē'bi-us), the father of ecclesiastical history, a Greek writer, born in Palestine about 265 A. D., died about 340. About 315 he was appointed Bishop of Cæsarea. He was the most learned man of his age and took an important part in the Council of Nicæa. Among his works are the *Church History*, a *Chronicle*, in two parts, *Martyrs of Palestine*, *Life of Constantine*, *Contra Hieroclem*, *Præparatio Evangelica*, *Demonstratio Evangelico*, and *Theophania*. The *Præparatio* is of especial interest as it contains copious extracts from classical writings. He believed he was living at the beginning of a new age and felt impelled to set forth the events leading up to that new era.

Eustachian Tube (ū-stā'ki-an), in anatomy, a canal leading from the pharynx to the tympanum of the ear. See *Ear* and *Eustachio*.

Eustachio (ū-stā'ki-o), BARTOLOMMEO, an Italian physician and anatomist, born soon after 1500; died about 1574. He devoted himself to medical science and in particular to anatomy, which he much enriched by his researches. Among his discoveries were the Eustachian tube (which see) and the Eustachian valve of the fetal heart.

Euterpe (ū-tėr'pē), (1) one of the Muses, considered as presiding over lyric poetry. The invention of the flute is ascribed to her. (2) In botany, a genus of palms, natives of Amboyna and Australia, and an untenable name for *Catis*, a genus of tall palm. See *Assia-palm*.

Euthanasia (ū-than-ā'si-a), an easy death, or a painless method of putting to death. It is often a question whether the use of narcotics or other means of shortening life should not be adopted, in the case of prolonged, painful and hopeless diseases, but such a custom might be open to abuses, and the ordinary medical method is to seek to prolong life to the latest possible moment.

Eutropius (ū-trō'pi-us), FLAVIUS, a Latin historian, who flourished about 360 A.D. His abridgment of the history of Rome (*Breviarium Historiæ Romanæ*) is written in a perspicuous style.

Eutyches (ū'ti-kēs), a Greek heresiarch who lived in the fifth century after Christ. He was superior of a monastery near Constantinople, and his heresy consisted in maintaining that after the incarnation there was only a divine nature in Christ under the appearance of a human body. The doctrines of Eutyches were condemned by the Council of Chalcedon in 45[illegible] and he was expelled from his monastery.

Euxine (ū'ksin; *Pontus Euxinus*), the ancient name for the Black Sea.

Evangelical [illegible]-kel), a term used to qualify certain theologic[illegible] especially strict views on the que[illegible] of the atonement, justification by fai[illegible] the inspiration and authority of the S[illegible]ptures, and allied doctrines. In Engla[illegible] the so-called Low Church party is eva[illegible]ical in its views. The 'Evangelical Ch[illegible]' is the official title of the Protestant [illegible]urch of Prussia, formed in 1817 by [illegible] of Lutherans and Calvinists.

Evangelical Alliance [illegible] associa[illegible] members of different sect[illegible] tian church, organized [illegible] 1846, to lend its influenc[illegible] evangelical doctrines (see [illegible] has held conferences at Paris, Geneva, New York, London, etc.

Evangelical Association, a body of American Christians, chiefly of German descent, established about the beginning of the last century. In form of government and mode of worship it generally agrees with the Methodist Episcopal Church.

Evangelical Union, the name of a religious sect, also familiarly known as the Morisonians, from the Rev. James Morison, its originator. It took rise in Scotland in 1840, and three years afterwards organized itself as a separate Christian denomination. The Morisonians maintain the universality of the atonement, combining with this the doctrine of eternal personal and unconditional election, and denying that any one will be condemned for Adam's fall. In point of church government the members of the Evangelical Union are independent. The body has about ninety congregations, chiefly in Scotland.

Evangelists (e-van'jel-ists) the writers of the history or doctrines, precepts, actions, life and death of Christ; in particular, the *four evangelists*, Matthew, Mark, Luke and John. The ancient symbols of the four evangelists are: for Matthew, *a man's face;* for Mark, *a lion;* for Luke, *an ox;* and for John, *a flying eagle.*

Evans (ev'ans), Mary Ann. See *Eliot, George.*

Evans, Oliver, born at Newport, Delaware, in 1755, was the inventor of the automatic flour-mill and the high-pressure steam engine, a steam dredge, and the 'Cornish boiler.' He projected a railroad to connect New York and Philadelphia, but lacked the means to build it. He died in New York in 1819.

Evans, Robert Dunglison, naval officer, born in Floyd Co., Virginia, in 1846; was graduated at the U. S. Naval Academy in 1863. He entered the navy during the later years of the Civil war, took part in both attacks on Fort Fisher, and was in command of the *Yorktown*, at Valparaiso, during the Chilean troubles with this country in 1891. His decisive actions here gave him the popular name of 'Fighting Bob Evans.' He took part in the naval fight off Santiago, Cuba, in 1898, as commander of the *Iowa*. He was commissioned rear admiral in 1901, and died in 1912.

Evans, Sir De Lacy, a British general, born at Moig in Ireland in 1787. After some years of service in India he joined the Army of Wellington in the Peninsula in 1812, where he served with distinction. In 1814 he was sent to America, and was present at the battles of Bladensburg and New Orleans, returning to Europe in time to take part in the battle of Waterloo. In 1830, 1831 and 1833 he was elected to parliament. In 1835 he was appointed to the command of 10,000 troops raised in Britain on behalf of the Queen of Spain. Under the training of Evans this force became an excellent army, and several times defeated the Carlists. During the Crimean war he distinguished himself as commander of the second division of the English army, and received the thanks of the House and other honors. He died in 1870.

Evans, Thomas William, a distinguished dentist, born at Philadelphia, Pennsylvania, in 1825. He studied dentistry, and became so expert that he was sent for from France to treat the teeth of Napoleon III. He dwelt in Paris during the remainder of his life, worked for members of all the royal houses of Europe, was loaded with gifts and decorations, and acquired a fortune of several million dollars. He became interested in military sanitation and founded the Red Cross Society. On the night of the revolutionary outbreak in Paris, after the decisive victory of the Germans over Napoleon's army, Sept. 4, 1870, the Empress Eugenie sought shelter in his house and was helped by him to escape to England. He died in 1897, leaving nearly the whole of his fortune to found a museum and dental institute in Philadelphia. Litigation followed, and more than ten years passed before the matter was settled in favor of the terms of his will.

Evanston (ev'ans-ton), a city of Cook County, Illinois, on Lake Michigan, 12 miles N. of Chicago. It is pleasantly situated, and is the seat of the Northwestern University, and other educational institutions. Pop. 24,978.

Evansville (ev'anz-vil), a city, capital of Vanderburg County, Indiana, the second in population in the State. It is situated on the Ohio River, 163 miles E. of St. Louis, and on several railroad lines. It is the center of a large tobacco-growing section and is an important soft-coal and lumber market. There are manufactures of furniture, brooms, buggies, steam shovels, stoves, pottery, cigars, etc. The public buildings include a courthouse, city hall, libraries and art gallery, U. S. marine hospital, etc. It is served by six steam railroads. Pop. 89,105.

Evaporation (e-vap-o-rā'shun), the conversion of a liquid or solid by heat into vapor or steam, which becomes dissipated into the atmos-

phere in the manner of an elastic fluid. The process of evaporation is constantly going on at the surface of the earth, but principally at the surface of the sea, of lakes, rivers and pools. The vapor thus formed, being specifically lighter than atmospheric air, rises to considerable heights above the earth's surface; and afterwards, by a partial condensation, forms clouds, and finally descends in rain.

Evarts (ev'arts), WILLIAM M., an eminent lawyer, born in Boston, Massachusetts, in 1818; was graduated at Yale and studied law at Harvard; began practice in New York about 1840, and subsequently became an active member of the Republican party. In the impeachment trial of President Johnson in 1868 he was his principal counsel, and in 1872 was counsel for the United States in the Alabama Claims arbitration. He served as Secretary of State during the administration of President Hayes and was United States Senator, 1885-91. He died in 1901.

Eveleth (ev'e-leth), a village of St. Louis Co., Minnesota, 71 miles N. N. W. of Duluth. Iron ore is mined here in great quantities. Pop. 7036.

Evelyn (ev'el-in), JOHN, an English writer of the seventeenth century, born at Wotton, in Surrey, in 1620; died there in 1706. After completing his course at Oxford he studied law at the Middle Temple, visited various parts of the continent, and in 1659 took the royal side in the civil war. He published numerous works, among which are *Sculptura, or the History and Art of Chalcography; Sylva, or a Discourse of Forest Trees;* treatises on gardening, architecture, etc. But by far his most important work is his *Memoirs*, comprehending a diary and correspondence, which are interesting contributions to the history of the time.

Evening-primrose, *Œnothera*, a genus of plants, nat. order Onagraceæ. *Œ. biennis*, an American species common in cottage gardens, is not unfrequent as an escaped plant in England.

Evening-star, or HESPERUS, the name given to the planet Venus when visible in the evening. It is also applied to Jupitar, when similarly visible after sunset.

Everett (ev'er-et), ALEXANDER HILL, an American diplomatist, born at Boston in 1792; died at Canton in 1847. After studying at Harvard, in 1809, he accompanied John Quincy Adams to St. Petersburg as secretary of legation. He afterwards filled successive diplomatic posts in the Netherlands, Spain and elsewhere. He was the author, among other works, of *Europe, or a General Survey of the Present Situation of the Principal Powers* (1822); and a similar work on America.

Everett, EDWARD, an American statesman and author, brother of the preceding, born at Dorchester, Massachusetts, in 1794. After traveling for some years in Germany and England, he returned to America in 1819 to occupy the chair of Greek literature at Harvard. He became editor of the *North American Review*, was prominent as an orator, and entering the political world, became successively member of Congress, governor of Massachusetts and minister plenipotentiary in England (1840). In 1845 he was appointed president of Harvard College, and in 1852 Secretary of State. Shortly after he retired into private life. He died in 1865.

Everett, a city of Middlesex Co., Massachusetts, 3 miles from Boston, on the Boston and Maine R. R. It has manufactures of iron and steel, automobiles, boots and shoes, varnishes, chemicals, etc. Here is a Home School for Young Ladies and the Parlin and Shute Memorial libraries. Pop. 33,484.

Everett, a city, county seat of Snohomish Co., Washington, on Port Gardner Bay, 33 miles N by E. of Seattle. It has important lumber and mining industries, shingle factories, fish canneries, shipyards; also manufactures of bricks, paper, furniture, mills and mining machinery, etc. Pop. 24,814.

Everglades (ev'er-glādz), a low marshy tract of country in Southern Florida, inundated with water and interspersed with patches or portions covered with high grass and trees. They are 100 miles long and 60 broad. Canals for draining them are under construction.

Evergreen (ev'er-grēn), a plant that retains its verdure through all the seasons, as the fir, the holly, the laurel, the cedar, the cypress, the juniper, the holm-oak and many others. Evergreens shed their old leaves in the spring or summer, after the new foliage has been formed, and consequently are verdant through all the winter season. They form a considerable part of the shrubs commonly cultivated in gardens, and are beautiful at all seasons of the year.

Eversion of the Eyelids, or ECTROPION, a disease in which the eyelids are turned outward, so as to expose the red internal

tunic. It occurs most frequently in the lower eyelid.

Evesham (ēvz'am), a town in England, in the county and 15 miles S. E. of Worcester, beautifully situated on the Avon, and giving name to a parliamentary division of the county. It was the seat of a monastery as early as the eighth century. Pop. (1911) 8341.

Eviction (e-vik'shun), the dispossession of a person from the occupancy of lands or tenements. The term occurs most commonly in connection with the proceedings by which a landlord ejects his tenant for non-payment of rent or on determination of the tenancy. In the case of evictions of tenants in Ireland, generally for non-paymet of rent, the tenants are frequently readmitted as caretakers, or under some other title.

Evidence (ev'i-dens) is that which makes certain and which enables the mind to see truth. It may be (*a*) *intuitive*, *i.e.*, resting on the direct testimony of consciousness, of perception or memory, or on fundamental principles of the human intellect; or it may be (*b*) *demonstrative*, *i.e.*, in a strict sense, proofs which establish with certainty as in mathematical science particular conclusions; or it may be (*c*) *probable*, under which class are ranked *moral evidence*, *legal evidence*, and generally every kind of evidence which, though it may be sufficient to satisfy the mind, is not an absolutely certain and incontrovertible demonstration.

In jurisprudence evidence is classified into that which is *direct* and *positive* and that which is *presumptive* and *circumstantial*. The former is that which is proved by some writing containing a positive statement of the facts and binding the party whom it affects; or that which is proved by some witness, who has, or avers himself to have, positive knowledge thereof by means of his senses. Whenever the fact is not so directly and positively established, but is deduced from other facts in evidence, it is *presumptive* and *circumstantial* only. The following are the leading rules regarding evidence in a court of law:—

(1) The point in issue is to be proved by the party who asserts the affirmative. But where one person charges another with a culpable omission this rule will not apply, the person who makes the charge being bound to prove it. (2) The best evidence must be given of which the nature of the thing is capable. (3) Hearsay evidence of a fact is not admissible. The principal exceptions to this rule are—death-bed declarations, evidence in questions of pedigree, public right, custom boundaries, declarations against interest, declarations which accompany the facts or are part of the *res gestæ*, etc. (4) Insane persons and idiots are incompetent to be witnesses. But persons temporarily insane are in their lucid intervals received as witnesses. Children are admissible as witnesses as soon as they have a competent share of understanding and know and feel the nature of an oath and of the obligation to speak the truth.

Evidences of Christianity. These may be divided broadly into two great classes, viz., *external evidences*, or the body of historical testimonies to the Christian revelation; and *internal evidences*, or arguments drawn from the nature of Christianity itself as exhibited in its teachings and effects, in favor of its divine origin. The first Christian apologies—those of Justin Martyr, Minucius Felix and Tertullian, written in the second century—were mainly intended as justifications of the Christian religion against the charges of atheism, immorality, etc., commonly made at that time. Of a more philosophical kind and dealing more comprehensively with the principles of religion and belief in general, are the works of Origen, Arnobius and Augustine in the centuries immediately succeeding. During the middle ages, the scientific representation of Christianity is mostly the work of the schoolmen occupied in welding Aristotelian or Platonic philosophy with the fabric of Christian dogmatics, or writing attacks on the Jewish and Mohammedan faiths.

In the sixteenth and seventeenth centuries the influences of the Renaissance and the Reformation gave rise to a spirit of inquiry and criticism which developed English deism as represented by Herbert and Hobbes in the seventeenth century, and Collins and Bolingbroke in the eighteenth. The general position of English deism was the acceptance of the belief in the existence of God, and the profession of natural religion along with opposition to the mysteries and special claims of Christianity. It was in confutation of this position that the great English works on the evidences of Christianity of Butler, Berkeley and Cudworth were written. In France the new spirit of inquiry was represented by Diderot, D'Holbach, and the encyclopedists in general, who assailed Christianity mainly on the ground that it was founded on imposture and superstition, and maintained by sacerdotal trickery and hypocrisy. No reply

of any great value was produced in the French church, although in the previous age Pascal in his *Pensées* had brought together some of the profoundest considerations yet offered in favor of revealed religion. The nineteenth century was distinguished by the strongly rationalistic spirit of its criticism. The works of such writers as Strauss, Bauer and Feuerbach, attempting to eliminate the supernatural and the mysterious in the origin of Christianity, were answered by the works of Neander, Ebrard and Ullmann on the other side. The historical method of investigation, represented alike by the Hegelian school and the Positivists in philosophy, and by the Evolutionists in science, is the basis of the chief attacks of the present time against the supernatural character of Christianity, the tendency of all being to hold that while Christianity is the highest and most perfect development to which the religious spirit has yet attained, it differs simply in degree of development from any other religion. Notable among later apologists of Christianity have been Paley (*Natural Theology*), Chalmers (*Natural Theology*), Mansel, Liddon and others, Lecturers of the Bampton Foundation; in Germany, Luthardt, Ewald, Baumstark, etc. Its assailants have been equally numerous.

Evil, THE ORIGIN OF, the subject of an appalling quantity of barren speculation. The difficulty of the question lies mainly in this, that the existence of evil in the world seems inconsistent with the view that it was created and is maintained by an omnipotent and beneficent creator. The various theories on the subject have all sought to elude this difficulty either by the supposition of some principle of evil equally eternal with that of good, or by regarding evil as having only a relative existence, being a kind of good in an imperfect and immature stage. Perhaps the oldest theory upon this subject is that of parseeism, or the religion of Zoroaster, according to which there were two original principles, one good (Ormuzd) and the other evil (Ahriman). This is the doctrine that is now very often spoken of as Manichæism, from the fact that it was adopted by Manes, who attempted to engraft it on the doctrine of Christianity. In contradistinction to this dualistic theory with reference to the origin of evil stand the Monistic theories of Brahmanism and Platonism. According to the Brahmanic doctrine of the emanation of all things from one original being (Brahma), this original being was regarded as the sole true existence, and the phenomenal world, with all the evils appearing in it, was held to be mere illusion. Similarly Plato held that the good was the essence of all things, and that the evil and imperfect contained in them had no real existence. The theory enunciated by Leibnitz in his *Theodicée* resembles that of Plato. In that work he assigns to the evil existing in the world created by God, which he holds to be the best of all possible worlds, a merely relative existence; all that we call evil is, he holds, only evil to us because we do not see it in relation to the rest of the universe, for in relation to the universe it is not evil but good, and accordingly cannot be evil in its own nature. Another view on the subject is that which neither assigns to the evil principle (as it does to God or the good principle) an original existence nor denies the real existence of evil, but ascribes it to the exercise of man's free will.

Evil Eye, a power which, according to an old and widespread superstition, resides in some people of doing injury to others by a mere look, or a look accompanied by certain words or charms. This belief, common among the ancients, is still prevalent among the more ignorant classes in Italy, Russia, Andalusia, Turkey, Egypt, the Highlands of Scotland and other places.

Evolute (ĕv'o-lūt), in geometry, a curve from which another curve, called the *involute* or *evolvent*, is described by the end of a thread gradually wound upon the former, or unwound from it.

Evolution (ev-u-lū'shun), literally the act of unrolling or unfolding, but used as a term in science and philosophy to indicate the development of an organism or organic entity towards greater differentiation of organs and functions, and, therefore, to a more complex and higher state of being. Thus, in astronomy, the nebular hypothesis, which regards the planetary bodies as evolved from nebular or gaseous matter, is an example of evolution. In geology, also, the old view which considered the animal and vegetable life of each geological period as a new and separate organic creation, has given place to the evolutionary theory of a process of development from earlier types to those of the later periods. But the evolution of the more complex from the more simple organisms does not necessarily, probably never does, exhibit a linear series of advances; thus, of the protoplasm which represents the first stage of an animal's existence, part is set aside for one tissue, part for an-

other; in the same way, on the theory of the origin of certain animal or vegetable forms from a common stock, some members of a group have manifested such modifications as render them permanently unlike their kindred of whom some may retain for a longer or shorter time their original characters, while others become specialized in other directions. Evolution is a law whose operation is traceable throughout every department of nature. It may be equally well illustrated from the history of philosophy or the arts, or from the historical development of society. But it is in connection with the evolutionary theory of the origin of species that the principle of evolution has been most discussed, affirming, as it does, that all forms of life both in the animal and vegetable kingdom have been developed by continuous differentiation of organs and modifications of parts from one low form of life consisting of a minute cell. The steps by which this process has been accomplished and the causes which have been mainly at work in it form a department of research to which many notable scientists—Lamarck, St. Hilaire, Meckel, Hæckel, Spencer, Darwin, Wallace and others have contributed. One of the greatest contributions to the theory has been the work of Mr. Darwin (*On the Origin of Species*), in which he has produced some of the strongest evidence in favor of evolution as an endless progression evolving higher species, genera, families, orders, classes, the infinitely varied forms being each adapted to the circumstances by which it is surrounded. See also *Natural Selection, Species.*

Evolution, in mathematics, the process of extracting the roots of numbers or quantities.

Evolvent (ē-vol'vent), in mathematics. See *Evolute.*

Evora (ev'ō-ra), a town in Portugal, capital of the province of Alemtejo, 80 miles east of Lisbon. It is an ancient place, poorly built, and its walls, citadel and forts are all in a ruinous state. It has a Roman aqueduct still serviceable, a Gothic cathedral, an ecclesiastical seminary, etc. Pop. 16,-152.

Evremond, or EVREMONT. See *St. Evremond.*

Evreux (ev-reu), a town of N. W. France, capital of the department of Eure, in a fertile valley on the Iton. Although an ancient town with narrow streets, it is well built, has an ancient Gothic cathedral, a town house, two theological seminaries. Pop. (1906) 13,773.

Ewald (ā'vâlt), GEORG HEINRICH AUGUST VON, a German Orientalist and Biblical critic, born at Göttingen in 1803. After studying at the university there, in 1827 he became extraordinary, in 1831 ordinary professor of theology, and in 1835 professor of Oriental languages. In 1837 he lost his chair at Göttingen on account of his protest against the kings' abrogation of the liberal constitution, and became professor of theorogy at Tübingen, but in 1848 returned to his old chair at Göttingen. When Hanover was annexed by Prussia in 1866 he became a zealous defender of the rights of the ex-king. He died at Göttingen in 1875. Among his chief works are the following: *Complete Course of the Hebrew Language; The Poetical Books of the Old Testament; History of the People of Israel; Antiquities of the People of Israel.* The *History* is considered his greatest work.

Ewald (ā'vâl), JOHANNES, a Danish poet, born at Copenhagen in 1743; died in 1781. After studying theology at Copenhagen University he ran away and enlisted in the Prussian service, which he soon deserted for the Austrian. Having returned to Copenhagen, an elegy which he wrote on the death of Frederick V of Denmark was received with general admiration, and awoke in himself the consciousness of poetic talent. His reputation rapidly increased with the publication of his tragedies, *The Death of Balder, Adam and Eve, Rolfkrage,* etc.; and his odes and songs.

Ewald, JOHN, a Danish general, born at Cassel in 1744; died in 1813; said to have been a brother of the preceding. He fought for the United States in the Revolutionary war, entered the Danish service in 1788, rose to the rank of general, and distinguished himself in defense of the neutrality of Denmark about 1806. He wrote an able treatise, *Instructions in War.*

Ewing (ū'ing), THOMAS, an American statesman, born in Ohio Co., Virginia, in 1789; died in 1871. He became prominent in politics and in 1831 and again in 1850 was elected to the United States Senate. In 1841 he was appointed Secretary of the Treasury, in 1849 was made the first secretary of the Interior. Retiring from the Senate in 1851, he devoted himself to legal practice in Lancaster, Ohio.

Exarchate (egz-ār'kāt), a name of a province or territory under an *exarch*, or viceroy. In the sixth century after Christ Justinian formed the middle part of Italy into a province of the Eastern Empire, and gave the

government of it to an officer called an *exarch*. Exarch was also the title of an ecclesiastical grade in the Greek Church. Among the modern Greeks an *exarch* is a deputy of the patriarch.

Excalibur (eks-kal'i-bur), the famous sword of the mythical King Arthur. The story goes that it was sunk deep in a great stone, from which it could be drawn only by the man who was destined to be king.

Excavation, the process of removing rock or earth for the purpose of engineering construction, or of clearing the space for the foundations of a building. Where rock is encountered it must first be shattered by the use of explosives placed in holes drilled for the purpose. Some form of mechanical excavator is usually employed. This may be a steam shovel (which see) or a machine resembling a dredge, with a series of buckets running on an endless chain. The latter is suitable only for shallow cuttings.

Excelsior (eks-sel'si-or), the trade name of a fine quality of wood shavings, used in packing perishable goods and for stuffing mattresses, cushions, etc. The fibers are separated from wood blocks by an excelsior machine, which is a form of vertical planer using reciprocating cutters driven at high speed.

Exchange (eks-chanj'), a place in large commercial towns where merchants, agents, bankers, brokers and others concerned in commercial affairs meet at certain times for the transaction of business. See *Stock Exchange*.

Exchange, in commerce, that species of transactions by which the debts of individuals residing at a distance are canceled by order, draft, or bill of exchange, without the transmission of specie. Thus, a merchant in New York who owes $1000 worth of goods in London, gives a bill or order for that amount which can be negotiated through banking agencies or otherwise against similar debts owing by other parties in London who have payments to make in New York. This obviates the expense and risk of transmitting money. The process of liquidating obligations between different nations is carried on in the same way by an exchange of foreign bills. When all the accounts of one country correspond in value with those of another, the exchange between the countries will be *at par*, that is, the sum for which the bill is drawn in the one country will be the exact value of it in the other. Exchange is said to be *at par* when, for instance, a bill drawn in New York for the payment of $1000 in London can be purchased there for $1000. If it can be purchased for less, exchange is *under par* and is against London. If the purchaser is obliged to give more, exchange is *above par* and in favor of London. Although the thousand circumstances which incessantly affect the state of debt and credit prevent the ordinary course of exchange from being almost ever precisely at par, its fluctuations are confined within narrow limits, and if direct exchange is unfavorable between two countries this can often be obviated by the interposition of bills drawn on other countries where an opposite state of matters prevails. See also *Bill of Exchange*.

Exchange, Deed of, an original common law conveyance for the mutual transfer of real estate. It takes place between two contracting parties only, although several individuals may be included in each party; and the parties must take an equal estate, as fee-simple for fee-simple, legal estate for legal estate, copyhold for copyhold of the same manor, and the like.

Exchequer (eks-chek'ėr), in Britain, the department which deals with the moneys received and paid on behalf of the public services of the country. The public revenues are paid into the Bank of England (or of Ireland) to account of the exchequer, and these receipts as well as the necessary payments for the public service are under the supervision of an important official called the Controller and Auditor General, the payments being granted by him on receipt of the proper orders proceeding through the treasury. The public accounts are also audited in his department.

Exchequer, Chancellor of the. See *Chancellor*.

Exchequer, Court of, an ancient English court of record, established by William the Conqueror, and intended principally for the care and collection of the royal revenues. It was one of the supreme courts of common law, and is said to derive its name from the checkered cloth, resembling a chessboard, on which the sums were marked and scored with counters. The judges of this court were the chief baron and five junior or *puisné* barons. This court has been merged in the High Court of Justice. In Canada there is a Court of Exchequer for the Dominion.

Exchequer Bills, bills of credit issued by authority of the British Parliament as a means of raising money for temporary purposes.

They are of various sums—£100 or any multiple of £100—and bear interest (generally from 1½*d.* to 2½*d. per diem* on £100) according to a rate fixed at the beginning of each year. These bills pass from hand to hand as money, and form a principal part of the public unfunded debt of Great Britain. *Exchequer bonds* are similar, but they run for a definite number of years at a fixed rate of interest.

Excise (ek-sīz′), an inland duty or impost laid on commodities produced and consumed within a country, and also on licenses to manufacture and deal in certain commodities. Excise duties were introduced into England by the Long Parliament in 1643, being then laid on the makers and vendors of ale, beer, cider and perry. Being a convenient and productive source of revenue, they gained ground, and now furnish about two-sevenths of the public revenue. In the United States the term Internal Revenue is employed (which see).

Excitomotor Action, the action of nerves distributed to muscular organs, the stimulation of which leads to movement. Thus, irritation of a nerve supplying a muscle will lead to contraction of the muscle by excitomotor action, and irritation of certain nerves distributed to blood-vessels will lead to contraction of the vessel by acting on its muscular coat.

Excommunication (eks-ko-mū-nikā′shun), the exclusion of a Christian from the communion and spiritual privileges of the church. Excommunication was practiced early by the Christian Church. A distinction gradually arose between a lesser and a greater excommunication, the former being a suspension from church privileges, the latter a formal expulsion excluding from all communion with the faithful. In the middle ages the popes often excommunicated whole cities and kingdoms. In such a case all religious services ceased and the grave inconveniences thus caused made excommunication a formidable weapon in the hands of the pope, till with frequent abuse it lost its force. Besides excommunication an extreme degree of denunciation called *anathema*, and cutting the offender off from all the hopes and consolations of the Christian faith, is used in the Roman Catholic Church. In the Church of England both the less and the greater excommunication are recognized.

Excretion (eks-krē′shun), in physiology, the separation and carrying off of waste matter from an animal body, a function performed by the lungs, kidneys, bladder and the skin, besides the action of the intestinal canal.

Excubitorium (eks-ku-bi-tō′ri-um), in mediæval churches, a gallery where public watch was kept at night on the eve of some festival, and from which the great shrines could be seen.

Exe (eks), a river of England, which rises in Exmoor, in the county of Somerset, and after a southerly course of about 50 miles falls into the English Channel at Exmouth.

Execution (ek-se-kū′shun), in law, is a judicial writ grounded on a judgment of the court by which the writ is issued, and is granted for the purpose of carrying the judgment into effect, by having it executed. Execution is granted by a court only upon the judgments given by the same court, not upon those pronounced by another.

Execution, the carrying out of the punishment of death. See *Capital Punishment.*

Executioner (ek-se-kū′shun-er), the official who carries into effect a sentence of death, or inflicts capital punishment in pursuance of a legal warrant. This duty devolves upon the sheriff in England and the United States.

Executive (ekz-ek′ū-tiv), that branch of the government of a country by which the laws are carried into effect or the enforcement of them superintended. The term is used in distinction from the *legislative* and the *judicial* departments, and includes the supreme magistrate, whether emperor, king, president or governor, his cabinet or ministers, and a host of minor officials.

Executor (ekz-ek′ū-tor), in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the common law, appoint any person of sound mind and discretion, though otherwise under some legal disabilities as to contracting and transacting business in general, such as a married woman or a minor. The duties of executors and of administrators are, in general, the same, the difference of the two depending mostly on the mode of appointment, the executor being nominated by the testator, the administrator being appointed by the judge of probate. An executor is liable for any loss occurring to the estate through negligence for paying legatees before all debts are discharged.

Exegesis (eks-e-jē'sis), the exposition or interpretation of the Scriptures. The science which lays down the principles of the art of sacred interpretation is called *exegetics* or *hermeneutics*.

Exequatur (ek-se-kwā'tur; Lat. 'Let him accomplish'), a written recognition of a consul or commercial agent issued by the government to which he is accredited, and authorising him to exercise his powers.

Exergue (egz-ėrg'), the small space beneath the base line of a subject engraved on a coin or medal, left for the date, engraver's name, or something of minor importance.

Exeter (eks'ē-tėr), a city and river-port, of England, in the county of Devon, on the left bank of the Exe, 10 miles northwest from its outlet in the English Channel. It is pleasantly situated on the summit and slopes of an acclivity rising from the river, and has handsome squares, terraces and streets. Among the objects of interest are the cathedral (founded 1112), the remains of the castle of Rougemont, the Guildhall, the Albert Memorial Museum, St. Michael's Church, etc. Exeter has iron foundries, manufactories of agricultural implements, papermills, etc., and 'Honiton' lace is also made. By means of a canal vessels of 300 tons can reach the city. The largest vessels remain at Exmouth. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans, by whom it was called *Isca Damnoniorum*. Pop. 48,660.

Exfoliation (eks-fō-li-ā'shun), in surgery, the process by which a thin layer or scale of dead bone separates from the sound part.

Exhibition, Industrial, an exhibition of works of industry and art for the purpose of exciting public interest and promoting trade and manufactures. In 1798 an industrial exhibition of the products of French industry was held at Paris, and proved so successful that in 1802, during the consulate of Napoleon, another was held. The beneficial effects of these exhibitions were so obvious that a series of them was held at intervals, the eleventh and last thing held at Paris in 1849. In Britain exhibitions of a more or less local nature had been held in Dublin (1829), Manchester, Liverpool and Birmingham, and annually in London on the premises of the Society of Arts. The first on an international scale was the Crystal Palace Exhibition in Hyde Park, London, opened May 1, 1851. It covered an area of about 19 acres and attracted 15,000 exhibitors. An International Exhibition, on a small scale, was held at New York in 1853, and in 1855 the first French Exposition Universelle was opened in Paris. The buildings were erected in the Champs Elysées, and covered about 24 acres. This was followed by the national exhibitions of the Dutch at Haarlem and the Belgians at Brussels, both in 1861, and the following year by the second great international exhibition held in London. The building erected at South Kensington, covered about 17 acres. In 1865 an exhibition was held at Dublin, which, successful in other respects, was a pecuniary failure. The second French International Exhibition was opened on April 1, 1867, and closed on the 3d of November. It was erected on the Champ de Mars, and covered about 37 acres. The exhibitors numbered nearly 50,000, the visitors about 10,000,000. In 1871, the first of a series of British annual international exhibitions of fine arts and industry was opened in London, and continued through 1872, 1873 and 1874, but proved unsuccessful. In 1873 the first Austrian international exhibition was held in Vienna. In the United States, a great exhibition was held at Philadelphia in 1876 upon the occasion of the centennial festival of the American declaration of independence. It occupied 60 acres, and had nearly 10,000,000 visitors. A third French International Exhibition was held at Paris in 1878, the area occupied amounting in all to 140 acres, the visitors numbering about 17,000,000. A fourth was held in 1889, the latter being partly intended to commemorate the centenary of the French Revolution. One of its permanent features is the famous Eiffel Tower of iron, 984 feet high. In 1893 an International Exhibition of large proportions was held in Chicago, Illinois, to commemorate the 400th anniversary of the discovery of America. It occupied about 600 acres, the total admissions being over 27,000,000. The French held a great International Exposition at Paris in 1900, which, in the number of admissions, was far in excess of any similar affair. The Pan-American Exposition, Buffalo, New York, in 1901, was unique in its striking electrical display, and was made especially notable by the assassination of President McKinley while visiting it. The centenary of the Louisiana purchase was commemorated by a magnificent exhibition, on the grandest scale, at St. Louis in 1904. Many smaller exhibitions have been held in

the United States, including in recent years those commemorating the Lewis and Clarke exploration at Portland, Oregon, in 1905, the tricentenary of the settlement of Jamestown, Virginia, by one at Norfolk, in 1907, and the expansion of the Pacific States, by one at Seattle, Washington, in 1909. The Panama Pacific Exposition of 1915 (which see) surpassed all previous industrial exhibitions.

Exile (eks'il), originally banishment from one's native country by the compulsion of authority; now prolonged absence from one's country either enforced or undergone voluntarily.

Exmouth (eks'mouth), a town of England, in Devonshire, 10 miles S. S. E. of Exeter, at the mouth of the Exe. It is picturesquely situated, and is one of the handsomest sea-bathing places on the Devonshire coast. The chief industries are lacemaking and the fisheries. Pop. (1911) 11,963.

Exmouth, EDWARD PELLEW, VISCOUNT, a British naval officer, born in 1757; died in 1833. He went to sea at the age of thirteen, served as midshipman in the *Blonde* frigate during the American war, and greatly distinguished himself at Lake Champlain. In 1782 he was made a post-captain for a brilliant action in the *Pelican*, and on the outbreak of the war in 1793 was appointed to the command of the frigate *La Nymphe*. From this time till the peace in 1802 he was employed in active service. In 1804, on the resumption of hostilities, he was sent to take the chief command on the East India station, in the *Culloden*, of seventy-four guns; and here he remained till 1809, when he had attained the rank of vice-admiral. His next appointment was the command of the fleet blockading the Scheldt. In 1816 he proceeded to Algiers in command of a combined fleet of twenty-five English and Dutch ships to enforce the terms of a treaty regarding the abolition of Christian slavery which the dey had violated. He bombarded the city for seven hours, and inflicted such damage that the dey consented to every demand. Twelve hundred Christian slaves were freed.

Exocetus (eks-ō-sē'tus), EXOCŒTUS. See *Flying-fish*.

Exodus (eks'o-dus; Greek, *exodos*, a going out), the name given in the Septuagint to the second book of the Pentateuch, because it describes the departure of the Israelites from Egypt. The contents of the book are partly historical, describing the departure of the Israelites from Egypt, and partly legislative, describing the promulgation of the Sinaitic law. One of the difficulties connected with this book is that, according to Scriptural chronology, the residence of the Israelites in Egypt was only 215 years, and it seems incredible that in this time 'the threescore and ten souls' who accompanied Jacob to Egypt could have become the two and a half millions who left with Moses.

Exogenous Plants (eks-oj'e-nus), or EXOGENS, those plants whose stems are formed by successive additions to the outside. The exogens are the largest primary class of plants in the vegetable kingdom, and their increase by annual additions of new layers to the outside of their stems, formed in the cambium between the wood

EXOGENOUS PLANTS.

1. Section of a Branch of three years' growth, *a*, Medulla or pith. *b*, Medullary sheath. *c c*, Medullary rays. *c c*, Circles of annual growth. *d*, Bark. 2, Netted veined Leaf of Exogen (Oak). 3. Dicotyledonous Seed of Exogen. *a a*, Cotyledons. 4 Germination of Dicotyledonous Seed. *a a*, Seed leaves or Cotyledons. *o*, Plumula. 5, Exogenous Flowers (Crowfoot).

and the bark, is a feature in which they differ essentially from endogens, whose wood is formed by successive augmentations from the inside. The concentric circles thus annually formed, distinguishable even in the oldest trees, aid in computing the age of the tree. The stem and branches also exhibit a central pith and medullary rays extending outwards to the bark. All the trees of cold climates, and the principal part of those in hot, are exogenous, and are readily distinguished from those that are endogenous by the reticulated venation of their leaves, and by their seeds having two cotyledons (dicotyledonous). The parts of the flower are generally in fours or fives.

Exorcism (eks'or-sizm), the casting out of evil spirits by certain forms of words or ceremonies. An opinion prevailed in the ancient church that certain persons, those particularly

who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called *exorcism*. There were even certain men who made this a regular profession, and were called *exorcists*. Exorcism still makes a part of the beliefs of some churches. In the Roman Catholic Church exorcist is one of the inferior orders of the clergy.

Exosmose (eks'os-mōs), the opposite of *endosmose* (which see).

Exostemma (eks-os-tem'a), a genus of plants, nat. order Cinchonaceæ. The species are trees or shrubs, natives of tropical America and the West Indies. *E. caribæum* and *E. floribunda* possess properties similar to those of the true cinchona, but without any trace of either cinchonine or quinine.

Exostosis (eks-os-tō'sis), in surgery, a bony excrescence or growth from one of the bony structures of the body. It is generally found at the end of long bones near the joints, and in connection with the skull. Amputation is generally required.

Exotic (eks-ot'ik), belonging to foreign countries; a term used especially of plants. Exotic plants are such as belong to a soil and climate entirely different from the place where they are raised. They are nearly always greenhouse or hothouse plants.

Expansion (eks-pan'shun), in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; thus, water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water, in cooling, ceases to contract at 42° F.; and at about 39°, just before it reaches the freezing point (32°), it begins to expand again, and more and more rapidly as the freezing point is reached. This expansion is about one-eleventh of its bulk, and accounts for the bursting of pipes, etc., when water is freezing in them.

Expectation (eks-pek-tā'shun), in the doctrine of chances, the value of any prospect of prize or property depending upon the happening of some uncertain event. A sum of money in *expectation* upon a certain event has a determinate value before that event happens. If the chances of receiving or not receiving a hundred pounds, when an event arrives, are equal; then, before the arrival of the event the expectation is worth half the money.—*Expectation of life*, the probable duration of the life of individuals of any given age. A rough estimate of any one's expectation of life is made by calculating two-thirds of the difference between his or her present age and eighty.

Expectorants (eks-pek'tor-ants), in pharmacy, medicines which favor the discharge of mucus from the windpipe and air-passages of the lungs. Such are the stimulating gums and resins, squills, ipecacuanha, etc.

Experiment (eks-per'i-ment), an operation designed to discover some unknown truth, principle or effect, or to establish it when discovered. It differs from observation in the fact that the phenomena observed are, to a greater or less extent, controlled by human agency. Experiment distinguishes the modern method of investigating nature, and to it we owe the rapid strides made in chemistry, physics, etc.

Expert (eks-pert'), a person eminently skilled in any particular branch or profession; specifically a scientific or professional witness who gives evidence on matters connected with his profession, as an analytical chemist or a person skilled in handwriting.

Exploits (eks-ploits'), River of, a river which traverses nearly the whole of Newfoundland from S. W. to N. E. and falls into the Bay of Exploits. It is about 150 miles long, and is navigable for steamers 12 miles.

Explosion (eks-plō'zhun), a sudden disruption, generally due to the rapid production of gaseous matter from solids or liquids. Thus, the explosion of gunpowder is due to the sudden formation and expansion of gases into which the powder is converted by chemical agency. Explosions are often caused by the elastic force of steam confined in boilers, etc.

Explosives (eks-plō'sivz) are compounds practically available in war, in mining, and in general use for the sudden development of immense force. They comprise gunpowder, guncotton, nitroglycerine with its compounds dynamite, lithofracteur, and a large number of others, many of them of extraordinary power.

Exponent (ek-spō'nent), in algebra, the number or figure which, placed above a root at the right hand, denotes how often that root is repeated or how many multiplications are necessary to produce the power. Thus, a^2 denotes the second power of the root a, that is a, multiplied by a; a^4 denotes the fourth power. The figure is the *exponent* or index of the power. To express the roots of quantities fractional exponents are used:

thus $a^{\frac{1}{2}}$, $a^{\frac{1}{3}}$, $a^{\frac{1}{n}}$, denote the square root, the cubic root and the *n*th root of a.

Ex Post Facto (eks post fak'tō), in law, by something done after and bearing upon something previously done; thus, a law is said to be *ex post facto*, or retrospective, when it is enacted to punish an offense committed before the passing of the law. There is a provision in the Constitution of the United States that 'no ex post facto law shall be passed.' This has been interpreted to refer only to crimes, and in that sense the phrase is commonly used.

Express (eks-pres'), a special message, messenger or conveyance, sent on a particular occasion. The name is given to any regular provision made for the speedy transmission of messages, parcel, commission, and the like; and particularly to a railway train which travel at a specially high rate of speed, stopping only at the principal stations.

Expressed Oils (eks-prest'), in chemistry, are those which are obtainable from bodies only by pressing, to distinguish them from mineral and essential oils, which last are, for the most part, obtained by distillation.

Extension (eks-ten'shun). (1) In physics and metaphysics that property of a body by which it occupies a portion of space. Extension is an essential as well as a general property of matter, for it is impossible to form a conception of matter, however minute may be the particle, without connecting with it the idea of its having a certain bulk and occupying a certain quantity of space. Every body, however small, must have length, breadth and thickness; that is, it must possess the property of extension. Figure or form is the result of extension, for we cannot conceive that a body has length, breadth and thickness without its having some kind of figure, however irregular. (2) In logic, *extension* is the extent of the application of a general term, that is, the objects collectively which are included under it; thus, the word figure is more extensive than triangle, ci parallelogram, etc.; European more tensive than French, Frenchman, man, etc. Matter and mind are the extensive terms of which any definite ception can be formed. Extension is trasted with *comprehension* or *inten*

Extincteur (eks-tan-teur), an a ratus for the extinc of fire, consisting of a metallic case taining water, and materials for gene ing carbonic acid. When required materials are brought into contact pushing a rod which breaks a bottle taining acid, the gas mixes with water, and the pressure generated is cient to project the water charged the gas to a distance of 40 or 50 feet.

Extract (eks'trakt), a term to de all that can be dissolved of a substance by a specified menstru such as water, alcohol, ether, etc. modern pharmacy the term is applied two kinds of preparation from vegetab One is obtained by digesting the plant water or other solvent, and evaporat or distilling away the excess of solv until the extracted matter is sufficie inspissated. The other is got by bruis the plant in a mortar, separating juice, warming it until the green co ing matter separates, and filtering it The juice is next heated until the al men coagulates, and again filtered. juice is now evaporated to a syrup, green coloring matter added and mixed, and the evaporation is thereaf continued until the required concent tion is attained. Extracts must capable of being redissolved, so as form a solution like that from wh they were derived. Extracts are used cookery, medicine and the manufactu of perfumery.—*Extract of Meat* (*tractum carnis*) is a soft, yellowi brown, solid or very thick syrup, whi is employed as a portable soup. It now manufactured on the large scale processes proposed by Liebig.

Extradition (eks-tra-dish'un), act by which a pers accused of a crime is given up by the g ernment in whose territories he has tak refuge to the government of which he a subject. Treaties have been enter into by the United States with almo all civilized countries for the apprehe sion and extradition of persons charg with particular offenses, such as murde robbery, embezzlement by public office arson, rape, piracy, etc. The Constit tion of the United States provides th 'a person charged in any state wi treason, felony or other crime, who sha flee from justice and be found in anoth

state, shall, on demand of the executive authority of the state from which he fled, be delivered up to be removed to the state having jurisdiction of the crime.'

Extravaganza (eks-trav-a-gan'za), in music, the drama, etc., a species of composition designed to produce effect by its wild irregularity and incoherence; differing from a burlesque in being an original composition and not a mere travesty.

Extravasation (eks-trav-a-sā'shun), an escape of some fluid, as blood or urine, from the vessel containing it. *Blood extravasation*, in contusions and other accidents, is when blood-vessels are ruptured by the injury, and the blood finds it way into the neighboring tissues. In some accidents to the urethra and bladder extravasation of urine is a very serious occurrence.

Extreme Unction (eks'trēm ungk'shun) is, resting on Scripture authority, one of the seven sacraments of the Catholic Church. It is performed in cases of mortal disease by anointing in the form of a cross, the eyes, ears, nose, mouth, hands, feet and reins (in the case of males). It is administered after confession and the eucharist, and is believed to remove the last stains of sin. It can only be administered by a bishop or priest, and is not applied in the case of young children or excommunicated persons.

Extremities (eks-trem'i-tēz), the limbs, as distinguishing them from the other divisions of the animal, the head and trunk. The extremities are four in number, in man named upper and lower; in other animals anterior and posterior.

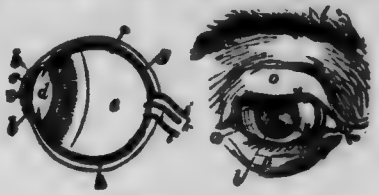
Exuma (eks-ū'ma), GREAT and LITTLE, two of the Bahama Islands. The former is 30 miles long and 3 miles wide, and has a good harbor. Pop. 2300.

Exuviæ (eks-ū'vi-ē), the cast-off parts or coverings of animals, as the skins of serpents and caterpillars, the shells of lobsters, etc.

Eyalet (ī'a-let), a former administrative division of the Turkish empire, subdivided into sanjaks or provinces, and kazas or districts. It was ruled by a pasha, and gave place to the vilayet on the reorganization of the empire in 1871.

Eyck (īk), HUBERT and JAN VAN, brothers, famous painters of the old Flemish school, born at Maaseyck, Hubert in 1366, Jan probably about 1390. They lived first at Bruges, whence the younger brother is called John of Bruges, and afterwards at Ghent, to which they removed about 1420. Here they executed the celebrated *Adoration of the Lamb* for the cathedral of Ghent, a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. It was in two horizontal divisions, comprising ten panels, of which only the two central ones remain at Ghent, the others being at Berlin. Hubert did not live to see it completed. He died at Ghent (1426), as did also his sister Margaret, who was likewise a painter (1431). Jan finished the work in 1432, and returned to Bruges, where he remained till his death, which took place in 1440, and executed several excellent pieces. His reputation became very great even during his lifetime, by his share in the introduction of oil-painting, the original invention of which has been incorrectly ascribed to him by many. Jan van Eyck also introduced improvements in linear and aerial perspective, and in painting upon glass.

Eye (I), the visual apparatus of animals, consisting in man of the globe of the eye, the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus. The walls of the globe of the eye are formed principally of two fibrous membranes, one white and opaque — the *sclerotic* (Gr. *sklēros*, hard)—which



HUMAN EYE.

Interior. *a*, Pupil. *b*, Iris. *c*, Cornea. *d*, Crystaline lens. *e*, Vitreous humor. *f*, Retina. *g*, Choiroid coat. *h*, Sclerotic coat. *i i*, Central vein of the retina. *k*, Optic nerve. *m*, Ciliary processes. *n*, Ciliary ligament or circle.
Exterior. *l*, Eyebrow. *o p*, upper and lower eyelid. *x x*, Eyelashes. The pupil and iris are also shown at *a* and *b* respectively.

envelopes two-thirds of the globe posteriorly; and the other transparent, and resembling a horny plate, whence its name, *cornea* (Lat. *cornus*, horny). The sclerotic is a tough, fibrous coat, and is the part to which the phrase 'white of the eye' is applied. In the front of the globe the sclerotic is abruptly transformed into the transparent portion (the cornea), which is circular, and which forms a window through which one can see into the interior. A mucous membrane, the *conjunctiva*, so named because it unites the eye to the lid, spreads over the ante-

rior portion of the globe, and then folds back on itself and lines the internal surface of the eyelids. On the internal surface of the sclerotic is a vascular membrane called the *choroid*. This is essentially the blood-vessel coat of the eyeball. The front part of the choroid terminates about the place where the sclerotic passes into the cornea in a series of ridges, the *ciliary processes*. The circular space thus left in front by the termination of the choroid is occupied by the *iris*, a round curtain, the structure seen through the cornea, differently colored in different individuals. In its center is a round hole, the *pupil*, which appears as if it were a black spot. The *iris* forms a sort of transverse partition dividing the cavity of the eyeball into two chambers, a small anterior chamber filled with the *aqueous humor*, and a large posterior chamber filled with *vitreous humor*. The *iris* consists of a framework of connective tissue, and its posterior surface is lined by cells containing pigment which gives the color to the eye. In its substance are bundles of involuntary muscular fibers, one set being arranged in a ring around the margin of the pupil, the other set radiating from the pupil like the spokes of a wheel. In a bright light the circular fibers contract and the pupil is made smaller, but in the dark these fibers relax and cause the pupil to dilate more or less widely, thus allowing only that quantity of luminous rays to enter the eye which is necessary to vision. Just behind the pupil is the *crystalline lens*, resembling a small, very strongly magnifying glass, convex on each side, though more so behind. The greater or less convexity of the surfaces of the lens determines whether the vision is long or short. The internal surface of the choroid, or rather the pigmentary layer which covers it, is lined by the *retina* or nervous tunic upon which the objects are depicted that we see. It appears to be formed by the expansion of the optic nerve, which enters the eye at its posterior part about one-tenth of an inch to the inner side of the axis of the eyeball, and forms at the bottom of the globe an enlargement, which is called the *papilla of the optic nerve*. Microscopists describe the retina as being composed of five, or even eight layers, of which the internal one is vascular and in contact with the vitreous; the external one, very important in a physiological point of view, is the *membrane of Jacob*. It is composed of cones and cylinders or *rods*, joined together like the stakes of a palisade, perpendicular to the plane of the membrane, and forming by their free extremities a mosiac, each microscopic division of which is about 0.001 of a line in diameter according to Robin, and 0.0008 of a line according to Helmolts; and represents a section of a rod. These rods and cones are believed to be the agents by whose aid the waves of light become transformed into the stimulus of a sensation. The ocular globe is put in motion in the orbit by six muscles, grouped two by two, which raise or lower the eye, turn it inward or outward, or on its antero-posterior axis. In these movements the center of the globe is immovable, and the eye moves round its transverse and vertical diameters. These three orders of movements are independent of each other, and may be made singly or in combination, in such a manner as to direct the pupil towards all points of the circumference of the orbit. Each eye is furnished with two eyelids, moved by muscles, which shield it from too much light and keep it from being injured. They are fringed with short, fine hairs called eyelashes; and along the edge of the lids is a row of glands similar to the sebaceous glands of the skin. The eybrows, ridges of thickened integument and muscle, situated on the upper circumference of the orbit and covered with short hairs, also regulate to some extent the admission of light by muscular contraction. In reptiles, some fishes (sharks, etc.), in birds, and in some mammals a third eyelid, or nictitating membrane, is present, and can be drawn over the surface of the eye so as to clear it of foreign matters, and also to modify the light. The lachrymal apparatus is composed of, first, the *lachrymal gland*, which lies in a depression of the orbital arch; secondly, of the *lachrymal canals*, by which the tears are poured out upon the conjunctiva a little above the border of the upper lid; thirdly, the *lachrymal ducts*, which are destined to receive the tears after they have bathed the eye, and of which the orifices or *lachrymal points* are seen near the internal commissure of the lids; fourthly, the *lachrymal sac*, in which the lachrymal ducts terminate, and which empties the tears into the *lachrymo-nasal canal*. The tears, by running over the surface of the conjunctiva, render it supple and facilitate the movements of the globe and eyelids by loosening the friction. The influence of moral or physical causes increases their secretion, and when the lachrymal ducts do not suffice to carry them off they run over the lids.

Vision.—The retina renders the eye

sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to converge the luminous rays to a focus on the surface of the retina, a condition necessary for distinct vision and the clear perception of objects. The visual impressions are transmitted from the retina to the brain by means of the optic nerve, of which that membrane appears to be the expansion. The two optic nerves converge from the base of the orbit toward the center of the base of the skull, where there is an interlacement of their fibers in such a manner that a portion of the right nerve goes to the left side of the brain, and a part of the left nerve to the right side; this is called the *chiasma* or *commissure* of the optic nerves. The principal advantage of having two eyes is in the estimation of distance and the perception of relief. In order to see a point as single by two eyes we must make its two images fall on corresponding points of the retinas; and this implies a greater or less convergence of the optic axes according as the object is nearer or more remote. To accommodate the eye to different distances the lens is capable of altering itself with great precision and rapidity. When we look at a near object the anterior surface of the lens bulges forward, becoming more convex the nearer the object; the more distant the object the more the lens is flattened. When the transparency of the cornea, the crystalline lens, or any of the humors, is destroyed, either partially or entirely, then will partial or total blindness follow, since no image can be formed upon the retina; but although all the humors and the cornea be perfectly transparent, and retain their proper forms, which is likewise necessary to distinct vision, yet, from weakness or inactivity of the optic nerves, or injury of the central ganglia with which it is connected, weakness of sight or total blindness may ensue. Defective vision may also arise from the crystalline lens being so convex as to form an image before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the lens may be too flat, as is the case in old age; a defect which is corrected by convex lenses. In the lower forms of life the organs of sight appear as mere pigment spots. Ascending higher, simple lenses or refracting bodies occur. Insects, crustaceans, etc., have large masses of simple eyes or ocelli aggregated together to form compound eyes—the separate facets or lenses being optically distinct, and sometimes numbering many thousands. In the molluscs well-developed eyes approaching in structure those of the highest animals are found; and in all vertebrate animals the organ of vision corresponds generally to what has been described, though they vary much in structure and adaptation to the surroundings of the animal.

Eye, in agriculture and gardening, signifies a bud or shoot of a plant or tuber.

Eye (ā), a municipal borough, [illegible] County Suffolk, 19 miles [illegible] Ipswich. Up till 1885 it sent a [illegible] to Parliament, and it still gives [illegible] a parl. division of the county. Pop. [illegible]

Eyebright (ī'brit; *Euphrasia officinālis*), a small plant belonging to the nat. order Scrophulariaceæ, which is common in Britain and most parts of Europe, in North Asia, etc. It is annual, from 3 to 8 inches high, often much branched. The whole plant has a bitter taste. Under the name of *euphrasy* it formerly enjoyed a great reputation in diseases of the eyes.

Eyelid (īlid). See *Eye*.

Eyemouth (ī'mouth), a fishing town of Berwickshire, Scotland, at the mouth of the Eye, an important place in the thirteenth century. Pop. 2436.

Eyepiece, in a telescope, microscope, or other optical instrument, the lens, or combination of lenses to which the eye is applied.

Eylau (ī'lou), a small town, about 28 miles distant from Königsberg, in Prussia, famous for a bloody battle fought between Napoleon and the allied Russians and Prussians, on the 7th and 8th of February, 1807. Both sides claimed the victory. The loss of the allies was about 20,000 men, while that of the French must have been considerably greater.

Eyre (ār), Edward John, an Australian explorer and colonial governor, born in Yorkshire, England, in 1815. He went to Australia in 1833, in 1839 discovered Lake Torrens, and in 1840 explored its eastern shores and the adjacent Flinders Range. He then commenced his perilous journey along the shores of the Great Australian Bight, and reached King George's Sound, in Western Australia, a distance of 1200 miles, with a single native boy, having

left Adelaide more than a year before. In 1845 he published *Discoveries in Central Australia*. After filling several governorships he was appointed governor of Jamaica in 1862. In 1865 he was confronted with a negro rebellion which he crushed with some severity, and was recalled. On his return to England John Stuart Mill and others took measures to try him for murder, but failed. Carlyle was one of his most strenuous defenders. He died in 1900.

Eyre, LAKE, a large salt-water lake of South Australia. Area about 4000 sq. miles, but it is subject to great fluctuations in size.

Ezekiel (ē-zē'ki-el; 'God shall strengthen'), the third of the great prophets, a priest, and the son of Buzi. He was carried away when young (about 599 B.C.) into the Babylonish captivity. His prophetic career extended over a period of 22 years, from the 5th to the 27th year of the captivity. The Book of Ezekiel contains predictions made before the fall of Jerusalem, in 586 B.C. (chaps. i-xxiv), prophecies against some of the neighboring tribes (chaps. xxv-xxxii), prophecies concerning the future of Israel (xxxiii-xxxix), and a series of visions relating to the circumstances of the people after the restoration.

Ezra (ez'ra), a celebrated Jewish scribe and priest. Under his guidance the second expedition of the Jews set out from Babylon to Palestine under the reign of Artaxerxes I, about 458 B.C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging and in some measure, it is believed, settling the canon of Scripture, are especially acknowledged by the Jews, and he has even been regarded as the second founder of the nation. Josephus states that he died in Jerusalem; others assert that he returned to Babylon and died there at the age of 120 years. The *Book of Ezra* contains an account of the favors bestowed upon the Jews by the Persian monarchs, the rebuilding of the temple, Ezra's mission to Jerusalem, and the various regulations and forms introduced by him. It is written partly in Hebrew and partly in Chaldee, which has led some to conclude that it is the work of different hands.

F

F, the sixth letter of the English alphabet, is a labio-dental articulation, formed by the passage of breath between the lower lip and the upper front teeth. It is classed as a surd spirant, its corresponding sonant spirant being *v*, which is distinguished from *f* by being pronounced with voice instead of breath, as may be perceived by pronouncing *of*, *ov*. (In *if*, *of*, however, *f* is = *v*.) The figure of the letter F is the same as that of the ancient Greek digamma, which it also closely resembles in power.

F, in music, is the fourth note of the diatonic scale.

Fa (fä), the name given by Guido to the fourth note of the natural diatonic scale of C.

Faam-tea or Faham-tea (fa'am), a name given to the dried leaves of the *Angræcum fragrans*, an orchid growing in the Mauritius and in India, and much prized for the fragrance of its leaves, an infusion of which is used as a stomachic and as an expectorant in pulmonary complaints.

Faber (fā'ber), FREDERICK WILLIAM, a theologian and hymn-writer, the nephew of George Stanley Faber, born at Durham in 1814. In 1845 he became a convert to Roman Catholicism, and founded the oratory of St. Philip Neri, afterwards transferred to Brompton. He died in 1863.

Faber, GEORGE STANLEY, an English popular theological writer, born in 1773, near Bradford in Yorkshire. He was educated at Oxford, and became a fellow of Lincoln College. He was appointed Bampton Lecturer in 1801; became a prebend in Salisbury Cathedral in 1831, and master of Sherburn Hospital, Durham, in 1832. He died in 1854. Amongst his principal writings are *Horæ Mosaicæ*, *The Doctrine of Regeneration*, and *A Dissertation on the Prophecies*.

Fabii (fa'bi-i), an ancient and renowned family of Rome, who, having undertaken the duty of defending Roman territory against the incursions of the Veientines, established themselves at a post on the river Cremera. Being drawn into an ambush, they were killed to a man (B.C. 477). A boy who happened to be left in Rome became the second founder of the family. Among its celebrated members in aftertimes was FABIUS MAXIMUS, whose policy of defensive warfare was so successful against Hannibal in the Second Punic war (B.C. 218-202); and FABIUS PICTOR, who lived about the same time and wrote a history of Rome, thus being the earliest Roman historian.

Fable (fā'bl), in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, in which animals and sometimes inanimate things are feigned to act and speak with human interests and passions for the purpose of inculcating a moral lesson in a pleasant and pointed manner. The fable consists properly of two parts —the symbolical representation and the application, or the instruction intended to be deduced from it, which latter is called the *moral* of the tale, and must be apparent in the fable itself. The oldest fables are supposed to be the oriental; among these the Indian fables of Pilpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. (See *Bidpai* and *Lokman*.) Amongst the Greeks Æsop is the master of a simple but very effective style of fable. The fables of Phædrus are a second-rate Latin version of those of Æsop. In modern times Gellert and Lessing among the Germans, Gay among the English, the Spanish Yriarte, and the Russian Ivan Kriloff are celebrated. The first place, however, amongst modern fabulists belongs to the French writer La Fontaine. See *La Fontaine*.

Fabliaux (fab'li-ō), in French literature, the short metrical tales of the Trouvères, or early poets of the Langue d'Oil, composed for the most part in the 12th and 13th centuries. These productions were intended merely for recitation, not for singing, and had as their principal subjects the current gossip and news of the day, which were treated in a witty and sarcastic way.

The fabliaux lashed not only the clergy and nobility in their degeneracy, but even mocked the religious spirit.

Fabre (fäbr) JEAN HENRI, a French scientist, born at Saint-Léons, Aveyron, December 21, 1823. He was a schoolmaster and professor of natural philosophy at the College of Ajaccio and the Lycée of Avignon. His books, including *The Mason Bees*, *The Life of the Spider*, and *The Life and Love of the Insect*, show the most minute and sympathetic observation of the habits of insects. He died October 11, 1915.

Fabriano (fä-brē-ä'nō), an episcopal city of Italy, province of Ancona. Pop. 9586.

Fabricius (fa-bris h'e-us), CAIUS (with the cognomen LUSCINUS), a pattern of Roman virtue. After having conquered the Samnites and Lucanians, and enriched his country with the spoils, of which he alone took nothing, he was sent on an embassy to Pyrrhus, king of Epirus, who tried in vain to corrupt him by large presents. In 275 B.C. Fabricius was chosen censor. He died about 250 B.C.

Fabricius (fa-brit'se-us), JOHANN ALBRECHT, a German scholar, born at Leipzig in 1668, became professor of rhetoric and moral philosophy at Hamburg, and published many learned works, among which are his *Bibliotheca Latina*, *Bibliotheca Ecclesiastica*, and *Bibliotheca Antiquaria*. He died in 1736.

Fabricius (fä-brit'se-us), JOHANN CHRISTIAN, a Danish entomologist, born in 1745; died in 1808. After studying at Copenhagen, Leyden, Edinburgh, and under Linnæus at Upsala, he obtained the post of professor of natural history in the University of Kiel. In 1775 appeared his *System of Entomology*, which gave to this science an entirely new form. In 1778 he published his *Philosophia Entomologica*, written upon the plan of the well-known *Philosophia Botanica* of Linnæus.

Façade (fa-säd' or fa-säd'), the face, front view, or principal elevation of a building. It usually contains the principal entrance.

Facciolati (fät-cho-lä'tē), JACOPO, an Italian classical scholar, born in 1682; died in 1769; professor in the University of Padua. The most important work with which he was connected was the *Totius Latinitātis Lexicon*, compiled by Forcellini under his direction and with his coöperation.

Face (fās), the front part of the head, the seat of the most of the senses. The bony basis of the face, exclusive of the thirty-two teeth (these not being in the strict sense bones), is composed of fourteen bones, called, in anatomy, the *bones of the face*. The anterior part of the skull (*os frontis*) also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the base of the skull. The other bones are firmly joined together and incapable of motion. In brutes the jaws project much more than in men, and form the prominent feature of the face, while the forehead recedes. (See *Facial Angle*.) The face of birds comprehends the ophthalmic regions, cheeks, temples, forehead and vertex; the face of insects includes all between the proboscis and the prothorax.

Facet, FACETTE (fas'et, fa-set'; literally a little face), one of a series of small circumscribed plane surfaces, as one of the small plane surfaces of a crystal or a cut gem.

Facetiæ (fa-sē'shi-ē), humorous sayings, witticisms, jests. There have been many collections of such. Amongst the most notable are the *Jests of Hierocles*, an old Greek collection, the *Liber Facetiarum* of Poggio Bracciolini, the *Apophthegms* of Bacon, *Joe Miller's Jest-Book*, etc.

Facial Angle (fā'shal), an angle of importance in the method of skull measurement, introduced by Camper, the Dutch anatomist, who

FACIAL ANGLE.
1, European. 2, Negro.

sought to establish a connection between the magnitude of this angle and the intelligence of different animals and men, maintaining that it is always greater as the intellectual powers are greater. Suppose a straight line drawn at the base of the skull, from the great occipital cavity across the external orifice of the ear to the bottom of the nose, and another straight line from the bottom of the nose, or from the roots of the upper incisors, to the most prominent part of the forehead, then both lines will form an angle which will be more or less acute. In apes this angle is only from 45° to 60°; in the skull of a negro, about 70°; in a European, from 75° to 85°. In another mode of drawing the lines the angle included between them varies

in man from 90° to 120°, and is more capable of comparison among the vertebrate animals than the angle of Camper. This angle though of some importance in the comparison of races, is fallacious as a test of individual capacity.

Facial Nerve, a nerve of the seventh pair of cranial nerves, a motor nerve which supplies the muscles of expression on either side of the face. Paralysis of this nerve produces *facial paralysis*, the result of which is that the affected side is smooth, unwrinkled, and motionless, the eyelids are wide open and cannot be closed, and the muscles of the sound side, having no collateral opposition, draw the mouth to that side.

Factor (fak'tur), in arithmetic, the multiplier and multiplicand, from the multiplication of which proceeds the product; thus 7 and 4 are the factors of 28. In algebra any expression which is considered as part of a product is considered a factor.

Factor, in commerce, an agent employed to do business for another in buying or selling, or in the charge of property. A factor seems to differ from a broker in holding a wider and more discretionary commission from his employer, in being able to buy and sell in his own name, and in having a lien on goods for his outlay; but the difference depends so much upon the usage of the particular trade, or upon the special instructions constituting the agency, that no exact line of demarkation can be drawn between them. The term factor has in common usage generally given place to the terms agent and broker, the former applied in the more general, the latter in the more restricted sense. It is still retained in some special cases, as in that of house factors and factors on landed property in Scotland, who have charge of the letting and general management of house property, farms, etc., called in England estate agents.

Factory (fak'tur-i; from *factor*), a name which appears originally to have been given to establishments of merchants and factors resident in foreign countries; it now more commonly signifies a place in which the various processes of a particular manufacture are carried on simultaneously. The rapid growth of factories in this sense is a comparatively recent development of industry, resulting from the free use of machinery and the consequent subdivision of labor. Amongst the advantages of the factory system are generally counted: 1st, increased productiveness arising from the minute division of labor; 2d, the mechanical accuracy and the cheapness of the product turned out by machinery; 3d, the facilities for union and co-operation for common improvement afforded by bringing large masses of workmen together. But this last consideration is probably more than counterbalanced by the smaller amount of independent intelligence called forth in the individual worker, through the monotony of the minutely subdivided operations. Decided disadvantages of the factory system are the unhealthiness of the crowded rooms, where the air is full of deleterious elements; and the increasing demand on the labor of women and children, interfering as it does with the economy of domestic life. See also next article.

Factory Acts, acts passed for the regulation of factories and similar establishments. Considering that women and children were not qualified fully to protect themselves against the strain of competition, the British legislature has passed a series of acts to regulate the conditions of their employment in factories. The immediate occasion of the first act passed to regulate factory employment in England was the outbreak of an epidemic disease which committed great havoc among the younger persons employed in factories in the district round Manchester at the beginning of the 19th century. An act was passed (1802) in which provision was made for the regular cleansing and ventilation of mills and factories, and also for limiting the hours of labor to twelve daily. Other acts were passed later further reducing the hours of labor and providing for proper sanitation, protection from danger, etc. In all the States of the American Union in which the factory is an industrial feature there has been legislation relative to the conditions of labor and the employment of women and children. Attention is given to the age of children employed, and attendance at public schools for a certain period each year is obligatory. The daily hours of labor are regulated. In some States the belting, shafting, etc., employed must be securely guarded. Penalties for violation of these provisions are designated.

Faculæ (fak'ū-lē), certain luminous spots sometimes visible on the sun's disc. These portions have a different spectrum from the other bright parts of the sun, as well as from the maculæ or dark sun-spots. See *Sun*.

Faculty (fak'ul-ti), the members taken collectively of the

medical or legal professions; thus we speak of the medical faculty, the faculty of advocates. The term is also used for the professors and teachers collectively of the several departments in a university; as, the faculty of arts, of theology, of medicine, or of law.

Faculty, in law, is a power to do something, the right to do which the law admits, or a special privilege granted by law to do something which would otherwise be forbidden.

Fæces (fē'sēz), the excrementitious part evacuated by animals. It varies, of course, with different species of animals, according to their diet. The main constituents are unassimilable parts of the food, on which the digestive process has no effect, and other portions, quite nutritious, but which have escaped digestion; also certain waste matters, etc. In disease the composition varies extremely.

Faed (fād), JOHN, a British artist, born in Kirkcudbrightshire in 1820. He showed artistic talent at an early age, in 1841 went to Edinburgh to study, and some years later acquired considerable reputation. Among his principal works are: *Shakespere and his Contemporaries; An Incident of Scottish Justice; The Morning after Flodden; A Wappenshaw;* two series of drawings illustrating *The Cotter's Saturday Night, The Soldier's Return, John Anderson My Jo,* and *Auld Mare Maggie.* In 1864 he went to London. He died in 1902.

Faed, THOMAS, younger brother of the preceding, born at the same place in 1826. He studied in Edinburgh, where at an early age he became known as a clever painter of rustic subjects. In 1852 he settled in London, where he won a high reputation. The subjects he painted were for the most part domestic or pathetic, and in these he contrived and told his own story, and that with a success that emulates Wilkie. Among his principal works are: *Sir Walter Scott and His Friends* (1849), *The Mitherless Bairn* (1855), *The First Break in the Family* (1857), *Sunday in the Backwoods* (1859), *His Only Pair* (1860), *From Dawn to Sunset* (1861), and *The Last o' the Clan* (1865). A number of Mr. Faed's works have been engraved in large size, and have been very popular. He died in 1900.

Faenza (fā-en'za), an episcopal city of N. Italy, in the province of and 19 miles southwest of Ravenna. It is supposed to have been the first Italian city in which earthenware was introduced; hence *Faience* (which see). The manufacture still flourishes here, and there is also a considerable trade in spinning and weaving silk. Pop. of commune 39,757.

Fagging (fag'ing), a custom which formerly prevailed generally at most of the English schools, and is still practised at Eton, Winchester, Harrow, Rugby, and one or two other places. It consists in making the junior boys act as servants or 'fags' in the performance of multifarious menial offices for the elder boys, such as carrying messages, preparing breakfast, etc., for their master in return for which the elder boy accepts a certain responsibility for keeping order, and becomes the recognised adviser and protector of his 'fags.'

Faggot-vote, a name in Britain for a vote procured by the purchase of property so as to constitute a nominal qualification without a substantial basis. Faggot-votes are chiefly used in county elections for members of parliament. The way in which they are usually manufactured is by the purchase of a property which is divided into as many lots as will constitute separate votes, and given to different persons, who may not be resident members of the constituency.

Fagotto (fa-got'tō), the Italian name of the bassoon (which see).

Fahlerz (fāl'erts), or gray copper ore, is of a steel-gray or iron-black color. It occurs crystallized in the form of the tetrahedron, also massive and disseminated. Its fracture is uneven or imperfectly conchoidal. Specific gravity, 4.5. It consists of from 30 to 40 per cent. of copper with admixture of iron and sulphur; but it also contains in very variable proportions zinc, lead, antimony, and silver.

Fahlunite. See *Falunite.*

Fahrenheit (fä'rē-n-hīt), GABRIEL DANIEL, a German physicist, known for his arrangement of the thermometer, was born at Dantzig in 1686. Abandoning the commercial profession for which he had been designed, he settled in Holland to study natural philosophy. In 1720 he effected a great improvement by the use of quicksilver instead of spirits of wine in thermometers. He invented the Fahrenheit scale (see *Thermometer*), and made several valuable discoveries in physics. He died in 1736.

Faidherbe (fā-derb), LOUIS LÉON CÉSAR, a French general, born in 1818, entered the army in 1840, served in Africa and the West Indies, was appointed governor of Senegal in

1854, and afterwards of a district in Algiers from 1867 to 1870. After the fall of Napoleon III he was summoned by the government of the National Defense to France and appointed commander of the army of the north. He fought some bloody but indecisive battles with the Germans under Manteuffel and Goeben. After the war he was elected to the Assembly by Lille, his native place, but on the triumph of Thiers retired from politics to private life. He wrote some valuable monographs on Senegal, the Soudan, and other parts of Africa. He died in 1889.

Faience (fā-yȧns'), imitation porcelain, a kind of fine pottery, superior to the common pottery in its glazing, beauty of form, and richness of painting, and of which several kinds are distinguished by critics. It derived its name from the town of Faenza, in Italy, where a fine sort of pottery called *majolica* was manufactured as early as the 14th century. The majolica reached its greatest perfection between 1530 and 1560. In the Louvre, at Berlin, and at Dresden are rich collections of it. The modern faience appears to have been invented about the middle of the 16th century at Faenza, as an imitation of majolica, and obtained its name in France, where a man from Faenza, having discovered a similar kind of clay at Nevers, had introduced the manufacture of it. True faience is made of a yellowish or ruddy earth, covered with an enamel which is usually white, but may be colored. This enamel is a glass rendered opaque by oxide of tin or other suitable material, and is intended not only to glaze the body, but to conceal it entirely. See *Pottery*.

Failly (fā-yē), Pierre Louis Charles Achille de, a French general, born in 1810. He distinguished himself in the Crimean war, and commanded a division against the Austrians in 1859. He was the means of introducing the Chassepot rifle into the French army, and commanded the troops which dispersed Garibaldi's irregulars at Mentana. At the outbreak of the Franco-German war Failly received the command of the Fifth Corps, but was severely criticised by his countrymen for the unskillfulness of his operations during the war. He died in 1892.

Fainéants (fā-nā-äṅ; Fr. 'do-noth-ings'), a sarcastic epithet applied to the later Merovingian kings of France, who were puppets in the hands of the mayors of the palace. Louis V, the last of the Carlovingian dynasty, received the same designation.

Fainting (fānt'ing), or syncope, a sudden suspension of the heart's action, of sensation, and the power of motion. It may be produced by loss of blood, pain, emotional disturbance, or organic or other diseases of the heart. It is to be treated by placing the patient on his back in a recumbent position or even with head slightly depressed, sprinkling cold water on his face, applying stimulant scents to the nostrils, or anything which tends to bring back the blood to the brain. The admission of fresh cool air and the loosening of any tight articles of dress are important.

Fairbairn (fār'bārn), Patrick, a Scottish theologian and author, born 1805; died 1874. He became a minister of the Established Church, but joined the Free Church at the disruption in 1843. In 1853 he was appointed professor of divinity in the Free Church College, Aberdeen, and in 1856 principal of the Free Church College, Glasgow. Among his works are *Typology of Scripture; Jonah, his Life, Character, and Mission; Ezekiel; Prophecy; Hermeneutical Manual; Pastoral Epistles of St. Paul*. He edited and wrote extensively for the *Imperial Bible Dictionary*.

Fairbairn, Sir William, a British civil engineer, born at Kelso, Roxburghshire, in 1789; died 1874. He was apprenticed as an engine-wright at a colliery in North Shields, and commenced business on his own account in Manchester with a Mr. Lillie in 1817, where he made many improvements in machinery, such as the use of iron instead of wood in the shafting of cotton-mills. About 1831, his attention having been attracted to the use of iron as a material for shipbuilding, he built the first iron ship. His firm became extensively employed in iron shipbuilding at Manchester and at Millwall, London, and had a great share in the development of the trade. He shares with Mr. Stephenson the merit of constructing the great tubular bridge across the Menai Strait. Fairbairn was one of the earliest members of the British Association for the Advancement of Science, of which he was president in 1861-62. He was created a baronet in 1869. He wrote many valuable professional books and papers, amongst which we may mention: *On Canal Steam Navigation* (1831); *Iron—its History, Properties, and Manufacture* (1841); *Application of Iron to Building Purposes* (1854); *Iron Shipbuilding* (1865). His brother Sir Peter, born 1799, died 1861, was also a mechanical genius, and had large machine works at Leeds.

Fairbanks (fâr'banks), CHARLES WARREN, vice-president, was born in Union Co., Ohio, in 1852. He engaged in legal practice in Indianapolis in 1874, took a prominent part in Republican politics, and was a candidate in 1893 for the United States Senate, but was defeated. He was elected to the Senate in 1897, and in 1898 was a member of the Joint High British-American Commission. He was vice-president of the United States, 1904-08, and was again nominated for that office in 1916, but was defeated. Died June 4, 1918.

Fairbanks, THADDEUS, American inventor and manufacturer, born at Brimfield, Mass., in 1796; died in 1868. At St. Johnsbury, Vt., he established a business for manufacturing cast-iron ploughs and stoves, and in 1831 received his first patent for an improved platform scale. Other varieties followed. His son, HENRY FAIRBANKS, born in 1830, was ordained to the Congregational ministry in 1857. Later he became vice-president of E. and T. Fairbanks & Co.

Fairbury (fâr'ber-i), a city, capital of Jefferson Co., Nebraska, 60 miles S. S. W. of Lincoln. It has flour and planing mills, iron-works, creamery, and nurseries. Pop. 5294.

Fairfax, THOMAS, LORD, a distinguished commander and leading character in English civil wars. He was born in 1611, at Denton, in Yorkshire, being son and heir of Ferdinando, Lord Fairfax, to whose title and estates he succeeded in 1648. After serving in the Netherlands with some reputation he returned to England, and on the rupture between Charles I and the Parliament joined the forces of the latter. In 1642 he was appointed general of the horse, and two years later held a chief command in the army sent to co-operate with the Scots. In 1645, on the resignation of the Earl of Essex, Fairfax became general-in-chief of the parliamentary army. After the victory at Naseby he marched into the western counties, quelling all opposition, put down the insurgents in Kent and Essex in 1647, and captured Colchester. In April, 1649, he was occupied along with Cromwell in suppressing revolt in the army; but positively declined to march against the Scottish Presbyterians. He was a member of Cromwell's first parliament. He co-operated in the restoration of Charles II, being one of the committee charged to secure his return. He died at Nun Appleton, Yorkshire, in 1671.

Fairhaven, a town in Bristol County, Massachusetts, 1 mile E. of New Bedford, on the New York, New Haven and Hartford Railroad. It has ironworks, tack factory, etc. Pop. 5122.

Fair Head, a basaltic promontory on the north coast of Ireland, County Antrim, rising to the height of 636 ft.

Fairies (fâr'ez), ELVES, etc., imaginary supernatural beings or spirits supposed to have considerable influence for good or evil in the affairs of men. The name *fairy* comes ultimately from the Latin *fatum*, fate. In the 12th century the poem of *Lancelot of the Lake* introduced the poetical treatment of the fairy world into France; and the fairies played an important part in the romantic works of the time. In the last part of the 17th century the true fairy tales first became popular, the Italians taking the lead in the *Pentameron* of Basilio. The fashion passed to France, where Perrault in 1697 published *Contes de ma Mère l'Oye.* Numerous imitations soon appeared. The best collections of later times have been the *Cabinet des Fées* (Paris and Geneva, 1786, thirty-seven vols.); those of the Brothers Grimm in German, and in English those of Keightley and Croker. As an original writer of fairy tales, Hans Christian Andersen, the celebrated Dane, deserves particular mention.

Fair Isle, an island lying nearly midway between the Orkney and Shetland islands, 3 miles long by 2 broad. It is inaccessible except at one point, and rises to the height of 480 ft. Some grain is grown, but the surface is better suited for sheep pasture. The men employ themselves in fishing, and the women knit a well-known variety of hosiery, an art which, it is said, the Spaniards introduced who escaped from a vessel of the Armada. Pop. 214.

Fairmont (fâr'mont), a city, capital of Marion Co., West Virginia, on the Monongahela river, 77 miles S. E. of Wheeling. Its buildings include a State normal school. It is an important mining city and has ironworks, glass factories, mining machinery plants, etc. Pop. 16,000.

Fair Oaks, BATTLE OF, fought at Fair Oaks in Virginia, 7 miles E. of Richmond, between the Confederates under Gen. Johnston and the Union troops under Gen. McClellan, 31st May, 1862. The loss on each side was nearly 6000 men; the result was indecisive.

Fairs (fârs), periodical meetings of persons having goods or wares for sale in an open market held at a particular place, and generally for the

transaction of a particular class of business. The origin of fairs is obviously to be traced to the convenience of bringing together at stated times the buyers and sellers of the stock-produce of a district. In Europe the numerous festivals of the church afforded the most favorable opportunity for the establishment of these markets. This association is indicated in the German name of a fair, which is identical with that used for the ceremony of the mass. In the middle ages fairs were of great importance, and were specially privileged and chartered by princes and magistrates, public proclamation being made of their commencement and duration. But modern facilities of communication have much diminished the necessity for periodical markets, and it is now chiefly amongst agriculturists that they are of much importance, large agricultural meetings being held in various districts for the sale of cattle and horses, and for the exhibition of agricultural implements. There are also, especially in Scotland, a considerable number of hiring fairs for farm-servants. In the less developed commerce of the East, however, they still retain much of their ancient importance and magnitude. In Europe the most important fairs of the present day are those at Leipzig and Frankfort-on-the-Main in Germany, at Lyons in France, and at Nijni-Novgorod in Russia. The latter is, indeed, the largest fair in the world. The fairs of Great Britain now mostly consist of the weekly market-days of country towns and the agricultural meetings already mentioned. In many places the old fair days are still kept, but are now merely an assemblage of penny theaters, peep-shows, and such amusements. In the United States there are no fairs of the kind so common in the old world; the term is applied to a variety of local exhibitions, especially of cattle and agricultural products; it also includes exhibitions and sales for religious and charitable purposes; likewise the fairs of the American Institute of New York, the Franklin Institute of Philadelphia, the Maryland Institute, and of many other organizations. For World's Fairs, see *Exhibition, Industrial.*

Fair Trade, an economical policy advocated by many in Britain, which, while not opposed to free trade in principle, would meet the prohibitory tariffs that foreign countries may put on British goods by placing equally heavy duties on goods sent from these countries to Britain. See *Free Trade.*

Fairweather, MOUNT, on the west coast of North America, in Alaska territory. It rises to the height of 14,900 feet, and is covered with perpetual snow.

Fairy Rings, a name given in Britain to rings often seen in fields, etc., formerly supposed to be traced by the fairies in their dances. There are two kinds—one of 6 or 7 yards in diameter, consisting of a bare ring or path, about a foot broad, with green grass in the middle of it; another of smaller dimensions, formed by a circle of grass, greener and fresher than that in the middle. They are ascribed to a kind of fungus.—FAIRY-RING MUSHROOM (*Marasmius oreades*) is a variety of edible mushroom that grows in an ever-widening circle, constantly spreading outward a few inches each year, the innermost sections dying. The stem has no ring, the gills are few and far apart, and the cap, as it becomes widely expanded, has a peculiar knob-like projection in the center. The cap and stem have a pinkish-buff color, and the gills a lighter shade of the same, varying in its younger stages toward a cream color. The spores are white. They can be found in many old, well-kept lawns. They seldom form complete circles. Several crops grow during each season.

Faith (fāth), the assent of the mind to the truth of what is declared by another, resting on his authority and veracity, either without other evidence or on probable evidence of any kind. In a special sense the term faith is used for the assent of the mind to what is given forth as a revelation of man's relation to God and the infinite, *i.e.*, a religious faith; and in Christian theology we have (1st) *historical or speculative faith*, or belief in the historic truthfulness of the Scripture narrative and the claims of Scripture to an inspired and supernatural origin: (2d) *Evangelical or saving faith*, that emotion of the mind (as Dwight defines it) which is called trust, or confidence exercised towards the moral character of God, and particularly of the Saviour.

Faith, CONFESSION OF. See *Confession of Faith.*

Faith Cure, a system in which it is claimed that ailments can be cured without remedies and through the exercise of faith alone. The faith appears to be in the ability of certain individuals to produce this result, or in certain objects, as an image of the Virgin or other religious emblem. That the mind has an influence over the condition of the body is undoubted, but that

the mind of another person can influence the physical conditions of a person is problematical. There are certain evidences in its favor, but far too much seems to be claimed for it.

Faizabad (fī-zä-bäd'). See *Fyzabad*.

Fakirs (fa-kērz'; lit. 'poor men'), a kind of fanatics met with chiefly in India and the neighboring countries, who retire from the world and give themselves up to contemplation. They are properly of the Mohammedan religion, but the term is often used for a mendicant of any faith. They are found both living in communities and solitary. The wandering fakirs gain the veneration of the lower classes by absurd penances and self-mutilations.—A name (pron. fā'kerz) also applied to peddlers in America.

Falaise (fà-lāz), a town of France, dep. Calvados, picturesquely situated on a rocky precipice (Fr. *falaise*) 23 miles S. S. E. of Caen. It contains several objects of interest, among others the ruined castle of the dukes of Normandy, where William the Conqueror was born. Pop. (1906) 6215.

Falashas. See *Abyssinia*.

Falckenstein (fal-kin'stīn), EDWARD VOGEL VON, a Prussian general, born in 1797; died in 1885. In 1813 he entered the Prussian army, distinguished himself at the battles of Katzbach and Montmirail. In 1848 he served in the Holstein campaign, and he acted as colonel and chief of staff in the war with Denmark in 1864. In the war of 1866 he commanded the Seventh Army Corps. On the outbreak of the Franco-German war in 1870 he was appointed military governor of the maritime provinces.

Falcon (fal'kn, fą'kn), a name of various birds of prey, members of the family Falconidæ (which see). The falcons proper (genus *Falco*), for strength, symmetry, and powers of flight are the most perfectly developed of the feathered race. They are distinguished by having the beak curved from the base, hooked at the point, the upper mandible with a notch or tooth on its cutting edge on either side, wings long and powerful, the second feather rather the longest, legs short and strong. The largest European falcons are the jerfalcon or gyrfalcon proper (*Falco gyrfalco*), a native of the Scandinavian Peninsula, and the Iceland falcon (*F. Islandicus*); to which may be also added the Greenland falcon (*F. Groenlandicus* or *candicans*). Between these three species much confusion at one time prevailed, but they are now distinctly defined and described. In the Greenland falcon the prevailing color at all ages is white, in the Iceland falcon dark. The latter more nearly resembles the true gyrfalcon of Norway, which, however, is

Peregrine Falcon (*Falco peregrinus*).

generally darker, rather smaller but with a longer tail. The average length of any of these falcons is about 2 feet. The Greenland species used to be the most highly prized by falconers. Its food consists chiefly of ptarmigans, hares, and water-fowl. It is found over a wide range of northern territory. The peregrine falcon (*F. peregrinus*) is not so large as the jerfalcon, but more elegant in shape. It chiefly inhabits wild districts, and nestles among rocks. It preys on grouse, partridges, ptarmigans, pigeons, rabbits, etc. Its flight is exceedingly swift, said to be as much as 150 miles an hour. The peregrine falcon was one of those most frequently used in falconry. Other European falcons are the hobby (*F. subbuteo*), formerly a great favorite for the chase of small game when falconry was in fashion; the merlin (*F. æsalon*), small but swift and spirited; the kestrel (*F. tinnunculus*), one of the most common. The term falcon is by sportsmen restricted to the female, the male, which is smaller and less courageous, being called *tiercel*, *tersel*, *tercelet*, or *falconet*. See *Falconry*.

Falcone (fâl-ko'nâ), ANCELLO, an Italian painter, born in 1600, studied along with Salvator Rosa under Spagnoletto. His paintings, consisting chiefly of battlepieces, are highly esteemed, but very rare. He died in 1665.

Falconer (fak'nėr), HUGH, a Scottish naturalist, born in 1808. After studying arts at Aberdeen and medicine at Edinburgh he went to

India as a surgeon in 1830. Here he made valuable geological researches, and turned his attention to the introduction of tea cultivation. He was appointed superintendent of the Saharanpur botanic garden in 1832 and of the Calcutta botanic garden in 1847. A collection of his papers, entitled *Palæontological Memoirs and Notes*, was published in 1868. In 1855 he returned to England, where he died in 1865.

Falconer, WILLIAM, poet and writer on naval affairs, born at Edinburgh in 1732; was drowned in 1769. He published a poem *(The Shipwreck)* and a *Universal Marine Dictionary.*

Falconidæ (fal-kon'i-dē), a family of birds of prey, in which the destructive powers are most perfectly developed. The family includes the different species of eagles as well as the hawks and falcons properly so-called, comprising the sub-families Buteoninæ (buzzards), Polyborinæ (caracaras), Aquilinæ (eagles), Falconinæ (falcons), Milvinæ (kites), Accipitrinæ (hawks), and Circinæ (harriers).

Falconio (fäl-kō'ni-ō) DIOMEDE, an Italian prelate born in Pescocostanzo, Italy, in 1842. He came to the U. S. as a missionary in 1865; was ordained a priest in the following year, holding educational and administrative positions in the U. S. and Newfoundland until 1883, when he returned to Italy; was consecrated bishop, 1892, and archbishop, 1895. He was Apostolic Delegate to Canada, 1899–1902; to the United States, 1902–1911; became cardinal, 1911.

Falconry (fal'kn-ri, fą'kn-ri), the pursuit of game by means of trained falcons or hawks; also called *Hawking.* Falconry is a very old amusement in Europe and Asia. In the middle ages it was the favorite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent. Charlemagne passed laws in regard to falconry. In Germany Henry the Fowler and the Emperor Frederick the Second were much addicted to this sport, the latter having written a work on falconry. In France it reached its height under Francis I, whose grand falconer had under him an establishment of 15 nobles and 50 falconers, costing annually about 40,000 livres. In Britain it was practised among the Anglo-Saxons, but grew still more in favor after the Norman Conquest. One of the most interesting English works on the subject is that which forms the first part of the *Boke of St. Albans*, first printed in 1481. In England the Duke of St. Albans is still hereditary grand falconer, and presents the king with a cast (or pair) of falcons on the day of his coronation. Falconry continued in favor till the 17th century; but the invention of firearms gradually superseded it, though in isolated instances gentlemen may still be found who pursue the sport to some little extent. In Persia and other eastern

Goshawk hooded for Falconry.

countries hawking is still in great favor. The training of a hawk is a matter requiring great pains and protracted attention, the natural wildness and intractableness of the birds being difficult to overcome. When a hawk suffers itself to be hooded and unhooded quietly and will leap on the hand of the trainer to receive food, its education is considered far advanced, and the trainer now endeavors to accustom it to the *lure.* This may be a piece of leather or wood covered with the wings and feathers of a bird and attached to a cord. The falcon is fed from it, and is recalled by the falconer swinging the lure round his head with an accompanying cry. When it has been taught to obey the lure it is then practised in the mode of seizing its game, which is first done with tame game attached to a peg. It is then made to fly at free game, and when it is fully trained it is used for sport. It is always kept hooded during excursions, until it is wanted to fly.

Faldstool (fąld'stōl), a folding stool provided with a cushion for a person to kneel on during the performance of certain acts of devotion, especially a kind of stool placed at the south side of the altar, on which the kings of England kneel at their coronation. The term is also given to a small desk at which the litany is enjoined to be sung or said.

Falernian Wine (fą-lĕr'ni-an), an ancient wine of

great repute amongst the Romans. It was made from the grapes grown on Mount Falernus in Campania. It was strong and generous, probably much resembling modern sherry.

Falieri (fa-li-ā'rē), MARINO, Doge of Venice, born in 1274, commanded the troops of the republic at the siege of Zara in Dalmatia, where he gained a brilliant victory over the King of Hungary. He succeeded Andrea Dandolo, 11th October, 1354, was accused of a design to overthrow the republic and make himself sovereign of the state, and beheaded 17th April, 1355. The last scenes of his life are depicted in Byron's tragedy of *Marino Falieri*.

Falkirk (fal'kĕrk; Scot. pron. fą'kirk), a burgh of Scotland, in Stirlingshire, 21½ miles west by north of Edinburgh. The older portion of it is old-fashioned and irregularly built. There are several modern suburbs. In the town or its vicinity are the Carron Ironworks, the Falkirk Foundry, and other works, collieries, chemical works, distilleries, etc. Falkirk is connected with the port of Grangemouth by a railway 3 miles long. The Trysts of Falkirk, held on Stenhousemuir, 3 miles to the N. N. W., are the largest cattle-fairs in Scotland. Falkirk is of great antiquity, and is associated with many remarkable historical events. In the neighborhood was fought the Battle of Falkirk in 1297 between Sir William Wallace and Edward I, the Scots, who were much inferior in numbers, being defeated. About 1 mile southwest from the town the Highlanders under Prince Charles defeated the royal forces under General Hawley, Jan. 17, 1746. Pop. (1911) 33,574.

Falkland (fąk'land), an ancient royal burgh of Scotland, county of Fife, 21 miles north of Edinburgh. It was once the residence of the Scottish kings, and possesses remains of an ancient palace and some curious old houses. There was formerly a castle here, in which David, the eldest son of Robert III, was starved to death by order of his uncle, the Duke of Albany, but no trace of it now remains. Pop. 809.

Falkland (fąk'land), LUCIUS CARY, VISCOUNT, an English worthy, born about 1610. His father being then Lord-deputy of Ireland, he was educated at Trinity College, Dublin. After passing a short time abroad he devoted himself to a life of retirement and the cultivation of polite literature, chiefly residing at his seat at Burford, near Oxford, which he made a kind of academy for the learned men of the neighboring universities. In 1639 he joined the expedition against Scotland; and in 1640, his peerage being Scottish, he was chosen member of the House of Commons for Newport, in the Isle of Wight. In the first instance he warmly supported the parliament, but doubts of the ultimate objects of the parliamentary leaders caused him to modify his attitude; and in 1642 he accepted from Charles I the office of secretary of state. When hostilities began he embraced decidedly the cause of the king, though he wished rather peace than victory. He was slain at the battle of Newbury, 20th Sept., 1643. He left behind him several pamphlets and published speeches, also a few poems, but nothing that explains the universal praises bestowed on him by contemporaries.

Falkland Islands, an island group belonging to Great Britain, in the South Atlantic Ocean, about 300 miles east of the Straits of Magellan. They consist of two larger islands, East Falkland and West Falkland, containing respectively about 3000 and 2300 square miles, with a great number of smaller ones surrounding them; total area, 6500 sq. miles. They are hilly and boggy, entirely destitute of trees, but covered with a variety of grasses very nutritive for the sheep and cattle the rearing of which is the principal industry. Fish and sea-fowl abound. Wool, frozen meat, hides, and tallow are the chief exports. The climate is equable and very healthy. The Falkland Islands were discovered by Davis on the 14th August, 1592. In 1710 a French vessel from St. Malo touched at them, and named them Isles Malouines. Settlements were afterwards formed on them by the French, Spaniards, and English alternately, but the latter have ultimately retained possession of them.

Fallacy (fal'a-si), in logic, is when an argument is used as decisive of a particular issue which in reality it does not decide. Properly a fallacy is a fault of reasoning (see *Logic*).

Fallières (fål'-yār'), ARMAND, president of the French Republic, 1906-13, was born at Mezin, Lot-et-Garonne, in the south of France, in 1841. He studied law and became mayor of Nerac in 1870. Elected to the Chamber of Deputies he soon became conspicuous as a debater. He served in various ministries from 1880, and in 1890 was elected senator. He was president of the senate from 1899 until he was elected eighth president of France, Jan. 17, 1906. He was succeeded in 1913 by Raymond Poincaré.

Fall of Bodies. All bodies on the earth, by virtue of the attraction of gravitation, tend to the center of the earth. A ball held in the hand presses downward; if dropped, it descends perpendicularly; if placed on an inclined plane, it rolls down, in doing which it presses the plane with a part of its weight. In the air bodies fall with unequal velocities, a piece of paper, for instance, more slowly than a ball of lead; and it was formerly thought that the velocity of the fall of bodies was in proportion to their weight. This error was attacked by Galileo, who, experimenting with balls of different substances which he dropped from the tower of Pisa, was led to the conclusion that the resistance of the air acting on different extents of surface was the cause of the unequal velocities, and that in a vacuum all bodies would fall with the same velocity. The truth of this last proposition was first demonstrated by Newton in his celebrated 'guinea-and-feather' experiment, where a guinea and feather are shown to fall side by side in the vacuum of the air-pump. This experiment proves that the force of gravitation in bodies is proportional to their inertia—that is, to their mass. The laws of falling bodies—that is, of bodies falling freely in a straight line and through a distance short in comparison with the earth's center are the following:—

1. When a body falls from rest it acquires velocity at the rate of about 32.2 feet per second. This number, which represents the acceleration due to the force of gravity, varies slightly with the locality, increasing from the equator to the poles, and diminishing as we recede from the center of the earth. (See *Gravity, Force of.*) At the end of five seconds, therefore, the body would be found to be moving at the rate of 5×32.2, that is, 161 feet per second.

2. The space fallen through in the first second is half of 32.2, that is 16.1 feet; and the space fallen through in any given time is found by multiplying the square of the number of seconds by 16.1. Thus, in three seconds a body falls 9×16.1 feet, or 144.9 feet.

3. The square of the velocity acquired by falling through any number of feet is found by multiplying twice that number by 32.2. Thus, if a body falls 9 feet, the square of the velocity acquired is $2 \times 32 \times 9$, or 576 feet per second, 32 being used instead of 32.2; and taking the square root of 576, we find that a velocity of 24 feet is acquired in a fall of 9 feet.

4. When a body is projected vertically upward with a given velocity, it continues to rise during a number of seconds found by dividing the number that expresses the velocity of projection by 32.2; and it rises to a height found by dividing the square of that number by 2×32.2, or 64.4. For a machine used in verifying the laws of falling bodies see *Attwood.*

Fall of Man, a commonly received doctrine of Christianity, founded upon the historical narrative contained in the third chapter of the book of Genesis, together with the allusions to the same matter in other parts of Scripture. Adam, having eaten of the forbidden fruit, is said to have fallen; and the relation of mankind in general to this fall is stated by St. Paul in the words: 'By one man's disobedience many were made sinners' (Rom., v, 19). Thus, in the fall of Adam all men are held to have fallen and to have contracted 'original sin,' alienating them from God and rendering them morally inadequate. The doctrine of the fall does not stand alone in Scripture. It is universally agreed by interpreters that in the original sentence pronounced on the transgressors there is contained the promise of a redemption, and that the whole scope of Scripture is directed to the development of this promise, and of the divine scheme of providence associated with it.

Fallopian Tubes (fa-lō'pi-an tūbs), in anatomy, are two ducts which open by one extremity into the womb, one at either angle of the fundus, and terminate at the other end in an open, trumpet-shaped mouth, which at certain times grasps the ovary and receives the ovum. They are named after Gabriel Fallopius or Falloppio, an Italian anatomist of the sixteenth century, who first recognized their functions.

Fallow Deer (fal'ō), an European and Western Asiatic deer, the *Cervus dama.* It is smaller than the stag, of a brownish-bay color, whitish beneath, on the insides of the limbs, and beneath the tail. The horns, which are peculiar to the male, are very different from those of the stag; they are not properly branched, but are broader towards the upper part, and divided into processes down the outside. A simple snag rises from the base of each, and a similar one at some distance from the first. It is often kept in parks.

Fallow Land is ground that has been left uncultivated for a time, in order that it may recover itself from an exhausted state. Strictly speaking, fallow ground is left alto-

gether without crops; but in agricultural usage strict fallow is not always adopted, and the term fallow is applied to various modes of treatment, of which at least three distinct varieties are recognized: *bare fallow*, *bastard fallow*, and *green-crop fallow*. Bare fallow is that in which the land remains completely bare for a whole year; in bastard fallow it is plowed up and worked after the removal of a spring or summer crop, preparatory to the sowing of a root or forage crop, to occupy the ground during autumn or winter; in green-crop fallow the land is sown with a root-crop, such as turnips or potatoes, placed in rows far enough apart to admit of the intermediate spaces being stirred, pulverized, and cleaned, during its growth, by horse or hand implements.

Fall River, county seat and port of Bristol County, Massachusetts, on an arm of Narragansett Bay and Taunton River, 53 miles s. s. w. of Boston. It is at the head of deep-water navigation, and the terminus of a line of steamers from New York. It has abundant water-power and very large and numerous cotton factories, an extensive hat factory, a piano factory, and calico-printing factories, foundries, etc. The city has two high schools and a free textile school, besides many public buildings. Its commerce is important. Pop. 119,295.

Falmouth (fal'muth), a seaport of Cornwall, England, 250 miles w. s. w. of London. There is a good harbor here, with a fine roadstead affording excellent refuge for shipping. Falmouth was at one time an important packet station, but is now chiefly a port of call, its principal trade being in supplies and stores for shipping. Pop. (1911) 13,130.

False Bay, a bay of the Cape Colony, having the Cape of Good Hope at its entrance. See *Cape of Good Hope*.

False Imprisonment, the unlawful imprisonment or detention of any person. Every confinement of the person is imprisonment, whether in a common prison or a private house, or even by forcibly detaining one in the streets or highways. The law punishes false imprisonment as a crime, besides giving reparation to the party injured, through an action of trespass.

False Personation. All forms of false personation, for the purpose of obtaining the property of others, are punishable by the criminal law; as instances, the personation of the owner of any share, stock, or annuity, etc.; the false personation of voters at an election is a misdemeanor, the punishment of which is determined by State statute, involving fine, imprisonment, and deprivation of the rights of citizenship of the convicted person for a certain period.

False Pretenses. False representations and statements, made with a fraudulent design to obtain 'money, goods, wares, and merchandise,' or trust, with intent to cheat. At common law a misdemeanor, punishable by statute.

False Prophecies, with intent to disturb the peace, are misdemeanors at common law.

False Signals. To exhibit a false signal, with a view to bring a ship into danger, is a felony, punishable by statute.

Falsetto (fäl-set'ō) applies, in singing, to the notes above the natural compass of the voice. It is also called the *head* or *throat* voice, in contradistinction to the *chest* voice, which is the natural one. The falsetto voice is produced by tightening the ligaments of the glottis.

False Weights and Measures. The using of false weights and measures is an offense at law punishable by fine. By various statutes standards are provided for weights and for measures of capacity or dimension, and all contracts of sale, etc., are referred to such standards unless there is a special agreement to the contrary. See *Weights and Measures*.

Falster (fäl'ster), an island belonging to Denmark, situated at the entrance of the Baltic, east of Laaland, from which it is separated only by a narrow strait; flat, well watered and wooded; productive in grain, pulse, potatoes, and, above all, fruit; area, 183 square miles. The principal town is Nykjöbing, Pop. 34,436.

Falun, or FAHLUN (fä'lun), a town of Sweden, on Lake Runn, 130 miles northwest of Stockholm. It has an excellent mining-school, museums, mineralogical collections, etc., Within the town boundary is the famous Falun copper-mine, formerly the richest in Sweden, and worked for 500 years. Silver and gold are also found here. Pop. 9606.

Falunite (fäl'un-īt), a mineral of a greenish color, occurring in six-sided prisms. Its chief constituent is hydrated silicate of alumina. It takes its name from Fahlun or Falun in Sweden.

Famagosta, or **Famagusta** (fä-mä-gös'ta), a seaport on the east coast of Cyprus. It is of remote antiquity, was an important place during the middle ages under the Lusignan kings of Cyprus and the Venetians, but, after being captured by the Turks in 1571, it declined. It has improved, however, in late years, since it came into the hands of the British.

Famatina (fa-ma-tē'na), a district and mountain range in the Argentine Republic, province of La Rioja, rich in copper; highest summit, the Nevada de Famatina, 19,758 feet high.

Familiar Spirits (fa-mil'yar), demons or evil spirits supposed to be continually within call and at the service of their masters, sometimes under an assumed shape, sometimes attached to a magical ring or the like, sometimes compelled by magic skill, and sometimes doing voluntary service. We find traces of this belief in all ages and countries, under various forms.

Family (fam'i-li), in zoological classifications, a group of individuals more comprehensive than a genus and less so than an order, a family usually containing a number of genera, while an order contains so many families. Family names usually terminate in -idæ (after Latin patronymics, such as Æacidæ, sons or descendants of Æacus). In botany it is sometimes used as a synonym of order.

Family Compact, the name given to a compact organized by the Duke de Choiseul, first minister of Louis XV, between the various members of the Bourbon family, then sovereigns of France, Spain, the Two Sicilies, Parma, and Piacenza; mutually to guarantee each other's possessions. It was signed 15th August, 1761, and entailed on Spain a war with England.

Famine (fam'in), a dire want of food affecting considerable numbers of people at the same time. Irregular rainfalls in tropical climates, imperfect methods of irrigation, or, as in Ireland, the too exclusive dependence of the mass of the people on a single article of food which happens to fail, are amongst the commonest causes of famines. In the early and mediæval ages they were frequent; but the rapidity of modern communication and transport has made the rigor of famine almost impossible in Europe. In Ireland the years 1814, 1816, 1822, 1831, and 1846, were marked by failure of the potato crop, and in the last-mentioned year the dearth was so great that £10,000,000 were voted by parliament for relief of the sufferers. India has long been the seat of terrific famines; but of late the British officials have been very successful in organising relief measures. Amongst the more recent are that in Northwest India (1899-1900), in which above 800,000 perished; that in Bengal and Orissa (1865-66), when about a million perished; that in Bengal (1874), which was very successfully treated; that in Bombay, Madras, Mysore (1877), in which about half a million died. In China a great famine took place in 1877-78, in which over nine millions are said to have perished; another took place in 1888-89 owing to the overflow of the Yellow River; in 1897 a frightful one occurred in India.

Fan, the name of various instruments for exciting a current of air by the propulsion of a broad surface or the rapid motion of a small surface. (1) An instrument made of wood or ivory, feathers, thin skin, paper, variously constructed and mounted, and used by ladies to set the air in motion towards and thus cool the face. As an article of luxury the fan was well known to the Greeks and Romans. They are said to have been introduced into England from Italy in the reign of Henry VIII. (2) Any contrivance of vanes or flat discs revolving by the aid of machinery, as for winnowing grain, for cooling fluids, urging combustion, assisting ventilation, etc., is also so called.

Fan, an abbreviation of *Fanatic*, applied to baseball enthusiasts, particularly those who attend professional games.

Fanariots, or **Phanariots** (fan-ar'i-ots), the inhabitants of the Greek quarter, or Phanar, in Constantinople, particularly the noble Greek families resident there since the times of the Byzantine emperors. The dragoman or interpreter of the Porte and other high officials used to be taken from their number. They have now mostly lost their influence at Constantinople, and have in many cases transferred themselves to Athens.

Fanaticism (fan-at'i-cizm), the term applied more particularly to the extravagance manifested in religious matters by those who allow themselves to be hurried away by their fancy and feelings, to the adoption not only of wild enthusiastic views, but also of inordinate and not infrequently persecuting measures. By an extension of the term it is also sometimes applied to other forms of extravagance. See *Fan*, second.

Fancy (fan'si) a term approaching imagination in meaning. In its general acceptation it refers both to the forms of the imagination and to the mental faculty which produces them; but it is used frequently for the lighter or more fantastic forms of the imagination, and for the active play of that faculty which produces them. See *Imagination*.

Fancy Goods, fabrics of various patterns; as ribbons, silks, satins, etc., differing from those which are of a plain or simple color, rather ornamental than solid or useful.

Fandango (fan-dang'go), an old Spanish dance, which originated most probably with the Moors in Andalusia. It is seldom danced but at the theater, and in the parties of the lower classes. It is danced by two persons only, who never touch so much as each other's hands; their reciprocal allurements, retreats, approaches, and varied movements, by turns pursuing and pursued, their looks, attitudes, and whole expression, are grossly indicative of voluptuousness.

Faneuil Hall (fan'ū-il), a public building in Boston, famous as the place where stirring speeches were made at the outbreak of the war for American independence. It obtained the name 'The cradle of American liberty.' It was enlarged in 1805.

Fanfare (fan'fār), a short, lively, loud, and warlike piece of music, composed for trumpets and kettle-drums. Also small, lively pieces performed on hunting-horns, in the chase.

Fan-foot, a name given to a North African lizard of the genus *Ptyodactylus* (P. Gecko), one of the geckoes, much dreaded in Egypt for its supposed venomous properties.

Fanning Islands (fan'ing), a group of coral islands in Central Polynesia between 1° 57′ and 5° 49′ N. lat., and between 157° and 162° W. lon. They include Jarvis, Christmas, Washington, Palmyra, and Fanning, and have been occupied by the British. The population is very small.

Fano (fā'nō), a seaport of Italy, on the Adriatic, province of Pesaro e Urbino, 29 miles northwest of Ancona. It is a handsome, well-built town, and has a triumphal arch, erected to Augustus, and other antiquities. Pop. 10,535.

Fan-palm, a name sometimes given to the talipot palm or *Corỳpha umbraculifèra*, a native of Ceylon and Malabar. (See *Talipot Palm.*) It is also applied to the Mauritia palm (*Mauritia flexuōsa*), a tree which grows in great abundance on the banks of the Orinoco River in South America, and which yields the natives of these regions food, wine (made from its sap), and cordage, besides serving them for housing during the inundations to which the country is subject.

Fans, an African race of people inhabiting the region of the west coast about the Gaboon River and the Ogoway. They are an energetic race, skilled in various arts, and are rapidly increasing in numbers. They are cannibals, but contact with Europeans is leading them to give up the practice.

Fanshaw (fan'shaw), Sir Richard, an English diplomatist, poet, and translator, born in 1608. He studied at Cambridge; was secretary of the English embassy at Madrid; and took the royal side on the outbreak of the civil war in 1641. He was made a baronet in 1650, was taken prisoner at Worcester, but permitted to go at large on bail. After the restoration he was employed on several diplomatic missions, and in 1664, as ambassador at Madrid, negotiated a peace between England, Spain, and Portugal. He died at Madrid in 1666. His poetical abilities were above mediocrity, as is evinced by his translations of the *Lusiad* of Camoens, the *Pastor Fido* of Guarini, the *Odes* of Horace, and the fourth book of the *Æneid*.

Fantail, a variety of the domestic pigeon, so called from the fan-like shape of their tails. Also a name applied to certain Australian birds of the fly-catcher family.

Fantasia (fan-tā'zi-a), in music, a species of composition in which the author ties himself to no particular theme, ranging as his fancy leads him amidst various airs and movements.

Fantee (fan-tē'), a country of Africa, on the Gold Coast, which extends about 90 miles along the shore of the Atlantic and 70 inland. The inhabitants, called *Fantees*, were the most numerous and powerful people situated immediately on the Gold Coast; but their power has been almost entirely broken since 1811 by repeated invasions of the Ashantees and they have since lived under British protection. The soil is fertile, producing, among other things, fruits, maize, and palm-wine.

Fan-tracery, in architecture, elaborate geometrical carved work, which spreads over the surface of a vaulting, rising from a corbel and diverging like the folds of a fan. Fan-tracery vaulting is much used in the Perpendicular style, in which the vault is covered by ribs and veins of tracery, of which all the principal lines diverge from

a point, as in Henry VII's chapel, Westminster.

Fan-tracery Vaulting, Beauchamp Chapel, Warwick.

Farad (far'ad), the unit of electrical capacity. Its name is derived from that of Michael Faraday, the famous electrician.

Faraday (far'a-dā), MICHAEL, one of the greatest of English chemists and physicists, was born in humble circumstances at Newington Butts, near London, on September 22, 1791. Early in life he was apprenticed to a bookbinder in London, but occupied himself in his leisure hours with electrical and other scientific experiments. Having been taken by a friend to Sir Humphry Davy's lectures, he attended the course, and conceived such an ardent desire for study that he resolved to quit trade. With this end he sent his notes of the lectures to Sir Humphry Davy, who was so struck with the great ability they showed that he appointed him his assistant at the Royal Institution. In 1829 he became lecturer at the Royal Military Academy at Woolwich, and in 1833 he was appointed to the newly-established chair of chemistry at the Royal Institution. It was while in this office that he made most of his great electrical discoveries. His communications to the *Philosophical Transactions* have been published separately in three vols. (1839, 1844, 1855). In 1832 he received the honorary degree of D. C. L. from Oxford, was made an honorary member of the Academy at Berlin with many other honors too numerous to mention. In 1835 he received a pension of £300 a year from Lord Melbourne. He died Aug. 25, 1867. As an experimentalist Faraday was considered the very first of his time. As a popular lecturer he was equally distinguished, and used to draw crowds to the Friday evening lecture at the Royal Institution. Among his published works we may mention the following:—*Researches in Electricity* (1831-55), *Lectures on Non-metallic Elements* (1853), *Lectures on the Forces of Matter* (1860), *Lectures on the Chemical History of a Candle* (1861).

Faradization (far-a-di-zā'shun), the medical application of the magneto-electric currents which Faraday discovered in 1837.

Farâfra (fä-rä'frä), the name of one of the Egyptian oases in the Libyan desert.

Farallones (fä-räl-yō'nēs), a group of small islands in the Pacific, about 30 miles from the entrance to the Bay of San Francisco.

Farandola (far-an'dō-la), an exciting dance popular amongst the peasants of the south of France and the neighboring part of Italy. The men and women, placed alternately and facing different ways, form a long line winding out and in with a waving motion.

Farce (fars), a dramatic piece of low comic character. It is grotesque and extravagant rather than artistically humorous.

Farcy (far'si), a disease to which horses are liable, intimately connected with glanders, the two diseases generally running into each other. It is supposed to be a disease of the absorbents of the skin, and its first indication is generally the appearance of little tumors called farcy buds on the face, neck, or inside of the thigh.

Fardel-bound (fär'del), a term applied to cattle and sheep affected with a disease caused by the retention of food in the maniplies or third stomach, between the numerous plaits of which it is firmly impacted. Overripe clover, vetches, or rye-grass is liable to produce the disease.

Fareham (fär'am), a town of England, in Hampshire, at the northwest extremity of Portsmouth harbor, giving name to a parl. div. of the county. It has building-yards, potteries, and brickworks, and a considerable trade. Pop. (1911) 9674.

Farel (far'al), GUILLAUME, one of the earliest and most active of the Swiss reformers, was born in 1489 in Dauphiny, and at an early period was led by his intercourse with the Waldenses to adopt similar views. After preaching in various parts of Switzerland, he came to Geneva, where he was so successful at the religious conferences of 1534 and

1535 that the council formally embraced the Reformation. He was instrumental, also, in persuading Calvin to take up his residence in Geneva. An attempt on the part of the two reformers to enforce too severe ecclesiastical discipline was the cause of their having to leave the city in 1538. Farel took up his residence at Neufchâtel, where he died in 1565.

Farewell (fâr-wel'), CAPE, a cape at the southern extremity of Greenland.

Fargo (fâr'gō), a city of Cass County, North Dakota, on the Red River of the North and the Great Northern Railroad, 254 miles W. of Duluth. It has iron, wire fence, flour and other manufactures, and is the seat of the State Agricultural and Fargo Colleges. Pop. 14,331.

Faria y Sousa, MANUEL, a Portuguese historian and poet, born in 1590, of an ancient and illustrious family; died about 1649.

Faribault (fâr'i-bō, far-i-bō), a city capital of Rice County, Minnesota, 53 miles S. of St. Paul. It has woolen and furniture factories. Its buildings include the State asylum for the deaf, dumb, and blind, and an Episcopal divinity college. Pop. 9001.

Faridpur (fâ-rēd-pör'), a district of India, in the Dacca Division of Bengal; area 2267 sq. miles. Chief town, Faridpur, on the Main Padmâ. Pop. 11,649.

Farina (fa-rī'na, fa-rē'na), a term given to a soft, tasteless, and commonly white powder, obtained by trituration of the seeds of cereal and leguminous plants, and of some roots, as the potato. It consists of gluten, starch, and mucilage.

Farinelli (fâr-i-nel'ē), CARLO, an Italian singer, born at Naples in 1705. His true name was Carlo Broschi, and to develop his vocal powers he was made a eunuch. He sung in Vienna, Paris, and London with the greatest success. On visiting Spain, where he intended only a brief sojourn, he found King Philip V plunged in a profound melancholy. He succeeded in rousing him from it by the powers of his voice, and became his prime favorite and political adviser. But the penalty of his advancement was that for ten years he had to sing every night to his royal master the same four airs. On his return to Italy, in 1760 he found himself almost forgotten, but continued to exercise a splendid hospitality in his country house, near Bologna. He died in 1782.

Faringdon (far'ing-don), a market town of England, county of Berks, 16 miles southwest of Oxford. Pop. about 3000.

Farini (fa-rē'nē), LUIGI CARLO, an Italian statesman and author, born in 1812. He studied medicine at Bologna, and practiced as a physician. He became known as a nationalist and patriot in the political movements of 1841, had to leave the country for a time, but returned and was made a member of the Reform Ministry at Rome during the disturbances of 1848. Disapproving equally the views of the old Conservative and the extreme Republican party, he went to Piedmont, where he was elected a deputy, and fought with great energy both in literature and in parliament on behalf of Cavour and the Piedmontese Constitutionalists. After the peace of Villafranca he was chosen dictator of the duchies of Parma and Modena, and was mainly instrumental in inducing them to unite with the Piedmontese monarchy. His *History of the Papal States from 1814 to 1850* is a well-known work. In 1862 he became president of the ministry. He lost his reason in 1863; died 1866.

Farley, JOHN M., CARDINAL (1842-1918), an American Roman Catholic prelate, born in Ireland. He came to America when he was 17 years old. He was secretary to Archbishop McCloskey 1872-84, pastor St. Gabriel's Church, New York, 1884-1896, became fourth Archbishop of New York 1902, and was elevated to the cardinalate in 1911.

Farmers' Alliance, an association of agriculturists in the United States which originated in Texas in 1873, in a coöperative effort against the depredations of cattle thieves. With increase of membership its purposes widened, and kindred societies were formed in other states, a general consolidation of the various societies being made in 1889 under the title of National Farmers' Alliance and Industrial Union. Its purposes were largely political, and out of it grew in 1892 the People's or Populist party, which for a decade had an active political career. The original association continued as a non-political organization, and is at present in active existence in the Southern and most of the Western States. A parallel organization, formed in Chicago in 1880, and also called the National Farmers' Alliance, extends over many of the Northern States.

Farmers-general (French, *Fermiers généraux*), private contractors, to whom under the old French monarchy was let out the collection of various branches of the revenue, poll-tax, duties on salt and tobacco,

customs, etc. These contractors made enormous profits on the farming of the public revenues. A revenue collected in this way not only imposed a much heavier burden on the people, but the merciless rigor of irresponsible and uncontrolled exactors subjected them to hardships and indignities to which they could not submit without degradation. In 1790 the system was suppressed by the constituent assembly.

Farming. See *Agriculture.*

Farne (färn; or FERNE) ISLANDS, a group of islets of England, in the German Ocean, off the north coast of Northumberland, 2 miles E. by S. of Bamborough Castle, and separated from the mainland by a channel of about 1¾ miles. They have been the scene of several disastrous shipwrecks.

Farnese (fär-nā'sā), an illustrious family of Italy, whose descent may be traced from about the middle of the thirteenth century, and which gave to the church and the Republic of Florence many eminent names, amongst which the following may be mentioned: PIETRO FARNESE (died 1363), a general of the Florentines in the war against Pisa; ALESSANDRO, who became Pope as Paul III (1534-49), and whose gifts to his natural son Pier Luigi of the duchies of Parma and Piacenza laid the foundation of the wealth and greatness of the family; OTTAVIO (1520-85), son and successor of Pier Luigi, spent a long and peaceful reign in promoting the happiness of his subjects ALESSANDRO (1546-92), elder son of Ottavio, became famous as a most successful general of the Spaniards in the wars with the Netherlands and France. RANUZIO (1569-1622), son of Ottavio, was a gloomy and suspicious tyrant. The line became extinct with Antonio in 1731. The name of the Farnese is associated with several famous buildings and works of art. The *Farnese Palace*, at Rome, was built by Pope Paul III while he was cardinal by Sangallo and Michael Angelo. It is now the residence of the dethroned Bourbon dynasty of Naples. Its sculpture gallery was formerly very celebrated, but the best pieces have been removed to Naples, including the following: The *Farnese Bull*, a celebrated ancient sculpture representing the punishment of Circe, discovered in the sixteenth century in the Baths of Caracalla at Rome; *Farnese Hercules*, a celebrated ancient statue of Hercules by Glycon, found in the Baths of Caracalla in 1540; *Farnese Flora*, a colossal statue of great merit, found in the Baths of Caracalla; *Farnese Cup*, an antique onyx cup, highly ornamented with figures in relief.

Farnham (färn'am), a town of England, county of Surrey, 3 miles S. W. of Aldershot; a well-built place. North of the town is Farnham Castle, the residence of the bishops of Winchester. The staple trade is in hops. Pop. (1911) 7365.

Farnworth (färn'wurth), a manufacturing township of Lancashire, England, 3 miles from Bolton. Pop. (1911) 28,142.

Faro (fä'rō), a seaport of Portugal, prov. of Algarve, 62 miles S. E. of Cape St. Vincent. It is surrounded by Moorish walls, and has a convenient harbor. Its trade is considerable. Pop. 11,789.

Faro (fä'rō), a promontory forming the northeast point of Sicily at the entrance to the Strait of Messina. The point is strongly fortified, and on it there is a lighthouse 200 years old.

Faro, or PHARO (fär'ō), a game of hazard at cards, played chiefly in gambling establishments, and in which the player plays against the bank, represented by a professional faro-banker.

Faroe Islands (fä'rō; Danish *Färöer*, 'Sheep Islands'), a group of islands in the North Atlantic, lying between Iceland and Shetland. They belong to Denmark, and are twenty-five in number, of which seventeen are inhabited. The islands generally present steep and lofty precipices to the sea. Barley is the only cereal that comes to maturity; turnips and potatoes thrive well. There is no wood, but plenty of excellent turf, and also coal. The inhabitants are chiefly engaged in fishing and the rearing of sheep. Thorshavn, in Strömö, the largest island, is the seat of government. Pop. 15,230.

Farquhar (fär'kwär), GEORGE, a comic writer of eminence, was born at Londonderry, in 1678. He tried the stage as an actor at Dublin, but soon left it to write plays for the London theaters. His first production was *Love in a Bottle*, performed at Drury Lane with great success in 1698. *The Constant Couple, Sir Harry Wildair, The Inconstant, the Recruiting Officer*, and *The Beaux' Stratagem* (reckoned his masterpiece) followed during the next six years. He died in 1707. Farquhar's wit is genuine, and his characters drawn from nature; but his plays have the licentious taint of the time.

Farragut (far'a-gut), DAVID GLASGOW, admiral of the United States Navy, was born near Knoxville, Tennessee, July 5, 1801, and entered the

navy as a midshipman when only ten years of age. In 1821 he was promoted to a lieutenancy, and was actively engaged in his profession until 1851, when he was appointed assistant inspector of ordnance. In 1855 he received a commission as captain. In 1861 he was assigned to go with the expedition against New Orleans, undertaken on the formation of the Confederacy, and sailed in February of the following year. New Orleans surrendered to the combined attack of the land and naval forces on 25th April, and Farragut proceeded to Vicksburg, which he safely ran past. In consequence of his success at New Orleans he was promoted to the rank of rear-admiral. In 1863 Farragut attempted to pass the batteries at Port Hudson, but was unsuccessful. In August, 1864, he attacked the Confederate fleet in the bay of Mobile, and forced it to surrender, thus making the fall of Mobile merely a question of time. July 25, 1866, he was made admiral, a grade which had not previously existed in the United States Navy. He died in 1870.

Farrakhabad (fa-rak'hä-bäd). See *Farukhabad.*

Farrant (far'ant), RICHARD, one of the earliest English composers of music. Very little is known of his history. He was a gentleman of the chapel royal in 1564, and subsequently organist and choirmaster. He is supposed to have died about 1580. His music, which is ecclesiastical, is distinguished by purity, simplicity, tenderness, and elevation. The anthems *Call to Remembrance*, and *Hide not Thou Thy Face*, composed by him, are well known and highly esteemed.

Farrar (far'ar), FREDERICK WILLIAM, theologian, was born in Bombay, 1831; graduated at Cambridge 1854; was assistant master at Harrow in 1855, master of Marlborough College in 1871, archdeacon of Westminster 1883. He published several popular theological works and works of fiction, and became known as a popular lecturer. He was Bampton Lecturer in 1885. Among his principal works are: *The Life of Christ* (1874), *Life of St. Paul* (1879), *The Early Days of Christianity* (1882), and *Lives of the Fathers* (1889). He died in 1903.

Farrer, HENRY, artist, born at London in 1843: died in 1903. He removed to New York in his youth and spent the remainder of his life in that city. He made a specialty of etching and water colors, and some of his landscapes are of surpassing beauty. He served as secretary of the American Water Color Society and president of the New York Etching Club. Among his Paintings are *The Old Homestead, A Windy Day, Sweet Restful Eve, Autumn,* etc.

Farrer, THOMAS CHARLES, painter, born at London in 1838. He studied drawing in a free school founded by Mr. Ruskin, and in 1858 came to New York, where he became a very successful teacher of art. He served on the Federal side in the Civil war and returned to England in 1869. His teachings exercised a notable and wholesome effect upon American art.

Farriery (far'i-e-ri). See *Veterinary Art.*

Farringdon (far'ring-don). See *Faringdon.*

Fars (färs), or FARSISTAN (fär-si-stän'), a maritime province in the southwest of Persia, abutting on the Persian Gulf. It is mountainous, but has many rich and well-cultivated districts. The most important products are grain, fruit, wine, oil, cotton, tobacco, silk, cochineal, and attar of roses. The manufactures include woolen, silk, and cotton goods; and in these and other articles an active trade is carried on chiefly with Hindustan. Pop. estimated at 1,700,000.

Farsan (fär-sän'), two islands on the east side of the Red Sea on the coast of Yemen, called respectively Farsan Kebir and Farsan Segir.

Farthing (fär'thing), the fourth part of a penny, the modern form of the Anglo-Saxon *feorthung*, the fourth part of anything. Until the time of Edward I a penny was the lowest coin, though John had issued a farthing for use in Ireland. Silver farthings were employed up to the reign of Edward VI, those of copper being first put into currency by Charles II in 1672, the old 'token' farthings being thus replaced.

Farukhabad, or FARRUKHABAD (far-ak-ä-bad'), a city in the Northwest Provinces of British India, 2 or 3 miles from the Ganges, a handsome well-built town, with avenues of trees in many of its streets. Pop. 67,338. The district has an area of 1720 square miles and forms part of the Doab. It is watered by branches of the Ganges canal. Pop. 925,812.

Fasano (fä-zä'nō), a town of South Italy, prov. of Bari. Pop. 16,848.

Fasces (fas'sēz), among the ancient Romans, a bundle of polished rods, in the middle of which was an axe, carried by lictors before the superior magistrates.

Fascia (fas'si-a, fash'i-a; Lat. a bandage), in anatomy signifies a thin, tendinous covering which surrounds the muscles of the limbs and binds them in their places.

Fascination (fas-i-nā'shun), the exercise of an overpowering and paralyzing influence upon some animals attributed to certain snakes corresponding somewhat to the so-called evil eye among human beings. Squirrels, mice, and the smaller birds are said to be the most subject to this power; but the fact is far from clearly explained, and is not perhaps even sufficiently demonstrated. Most of the accounts agree in describing the animal fascinated as having a painful consciousness of its danger, and the power exercised over it, but to be unable to resist the desire to approach the fascinator. Some have endeavored to explain this power as the effect of narcotic emanations from the serpent which stupefy the weaker animal. Others regard it as bearing a striking analogy to the mesmeric influence which one human being sometimes has over another.

Fascines (fas-sēnz'), in the military art, bundles of boughs or rods from 6 to 18 feet in length and usually 1 foot in diameter, used in raising batteries, strengthening parapets, riveting gabions, etc. The twigs are drawn tightly together by a cord, and bands are passed round them at the distance of 2 feet from each other. Very long thin ones are called *saucissons* or *battery-sausages*.

Fashion (fash'un), the prevalent style in dress and usages which society from time to time adopts and imposes by a sort of arbitrary law upon its members. In its less important details the law of fashion varies considerably, and is often little more than a play of caprice. On its better side it is an endeavor to embody in general and recognized forms the best judgment as to what is decorous and of good taste and feeling in the varying and often delicate situations which occur, where large and mixed companies are in the habit of meeting together. The circle of fashion is not necessarily coincident with that of gentility. A man may be of noble birth, wealthy, and distinguished without being fashionable.

Fashoda (fa-shō'dà), a large town built by the Egyptians in 1867 on the banks of the Nile in the Soudan, N. lat. 10°. It gives its name to that portion of the district. Since 1884 it has been in ruins, the Mahdi overthrowing Egyptian rule in that year. In 1898 Marchand, a French adventurer, hoisted the French flag there after a journey through Africa, but General Kitchener, the Anglo-Egyptian Sirdar, after defeating the Mahdi, marched to Fashoda, arriving shortly after Marchand, and after diplomatic negotiations the French withdrew.

Fasti (fas'tī; Lat.), among the Romans, registers of various kinds; as *fasti sacri*, calendars of the year, giving the days for festivals, courts, etc., being a sort of almanac.

Fasting (fast'ing), the partial or total abstinence of mankind and animals from the ordinary requisite supply of aliment, by which it is to be understood that quantity which is adapted to preserve them in a healthy and vigorous condition. It would appear that various warm-blooded animals are capable of sustaining total abstinence much longer than human beings. Cats and dogs have survived for several weeks without nourishment of any kind, but it is probable that few human beings could survive such deprivation for more than a week, though there have been examples of much longer abstinence from food. The use of water without solid food enables life to be sustained much longer than it could otherwise be.

Fasts, temporary abstentions from food, especially on religious grounds. Abstinence from food, accompanied with signs of humiliation and repentance or grief, is to be found more or less in almost all religions. Among the Jews fasts were numerous, and we find many instances of occasional fasting in the Old Testament. Herodotus says that the Egyptians prepared themselves by fasting for the celebration of the great festival of Isis. So in the Thesmophoria at Athens, and in the rites of Ceres at Rome, it was practiced. The Church of Rome distinguishes between days of fasting and of abstinence. The former are: 1, the forty days of Lent; 2, the Ember days, being the Wednesday, Friday, and Saturday of the first week in Lent, of Whitsun week, of the third week in September, and of the third week in Advent; 3, the Wednesdays and Fridays of the four weeks in Advent; 4, the vigils or eves of Whitsuntide, of the feasts of St. Peter and St. Paul, of the Assumption of the Virgin, of All Saints, and of Christmas day. When any fasting day falls upon Sunday it is observed on the Saturday before. The Greek Church observes four principal fasts: that of Lent, one beginning in the week after Whitsuntide, one for a fortnight before the Assumption, one forty days before Christmas. In the East, however, the strict

idea of a fast is more preserved than in the West. The Church of England appoints the following fixed days for fasting and abstinence between which no difference is made:—1, the forty days of Lent; 2, the Ember days at the four seasons; 3, the three Rogation days before Holy Thursday; 4, every Friday except Christmas day. The church, however, gives no directions concerning fasting.

Fat, an oily, concrete substance, a compound of carbon, hydrogen, and oxygen, deposited in the cells of the adipose or cellular tissue of animal bodies. In most parts of the body the fat lies immediately under the skin. Fat is of various degrees of consistence, as in tallow, lard, and oil. It is generally white or yellowish, with little smell or taste. It consists of two substances, stearin and elain or olein, the former of which is solid, the latter liquid. These elements are separated by pressing the fat between folds of bibulous paper, which absorbs the liquid or oil. By after-treatment with water the oil is separated from the paper. Fats are insoluble in water. Sodium borate is used to secure a mixture of fat and water, as in the making of cold cream. When boiled with caustic alkalies fats are decomposed (saponification), yielding an alkaline salt of the fatty acid (soap) and glycerin. Human fat appears to contain no stearin, but margarin and olein. It is an excellent packing material in the body, and gives the human frame its smooth, rounded contour. Being a bad conductor of heat, it is useful in retaining warmth, but its chief function is that of a nutritive reserve.

Fatalism (fā'tal-izm), the belief in fate, or an unchangeable destiny, to which everything is subject, uninfluenced by reason, and pre-established either by chance or the Creator. Amongst notable historical examples of the belief in fate may be mentioned the old Greek conception of a fate which stood behind the gods themselves as a controlling power; the Mohammedan fatalism, which regards all things great and small as inexorably predetermined, so that no accident is possible; the theological doctrine of predestination amongst Calvinists. See *Predestination.*

Fata Morgana (fä'ta mor-gä'na), a name given to a very striking optical illusion which has been principally remarked in the Strait of Messina, between the coasts of Sicily and Calabria—a variety of mirage (which see). The images of men, houses, towers, palaces, columns, trees, etc., are occasionally seen from the coast, sometimes in the water and sometimes in the air or at the surface of the water. The same object has frequently two images, one in the natural and the other in an inverted position. The images of a single object are said to be sometimes considerably multiplied.

Fategarh (*fat-e-gar'*), a town of the Northwest Provinces of India, 3 miles from Farukhabad, the scene of a massacre of upwards of 200 Europeans during the mutiny of 1857. It is now a suburb of Farukhabad.

Fatehpur (*fat-e-pör'*), an Indian town in a district of the same name, Allahabad division, Northwest Provinces. 50 miles S. E. of Cawnpore. Pop. 19,281. The district has an area of 1639 sq. miles.

Fatehpur Sikri, an Indian town, district of Agra, Northwest Provinces. It was the favorite residence of the Emperor Akbar, who enclosed and fortified it. It now chiefly consists of a vast expanse of magnificent ruins enclosed by a high stone wall some 5 miles in circuit. Pop 7147.

Fates (fāts; in Latin, *Parcæ,* in Greek, *Moirai*), in Greek and Latin mythology, the inexorable sisters who spin the thread of human life. The appellation *Clotho* (the spinner) was probably at first common to them all among the Greeks. As they were three in number, and poetry endeavored to designate them more precisely, *Clotho* became a proper name, as did also *Atrŏpos* and *Lachĕsis.* Clotho means she who spins (the thread of life); Atropos signifies unalterable fate; Lachesis, lot or chance; so that all three refer to the same subject under different points of view. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with scissors, with which she cuts it off. We find also in the northern mythology three beautiful virgins, the *Nornen,* who determine the fate of men. Their names are *Urd* (the past), *Varande* (the present), and *Skuld* (the future).

Fatherlasher (fa'ther-lash-er), a fish of the genus *Cottus* or bullhead (*Cottus bubălis*), from 8 to 10 inches in length. The head is large, and is furnished with several formidable spines. The fish is found on the rocky coasts of Britain, and near Newfoundland and Greenland. In the latter regions it attains a much larger size, and is a considerable article of food.

Fathers of the Church, or CHRISTIAN FATHERS. See *Church, Fathers of the.*

Fathom (fath'um), a unit of length equal to 6 feet. It is chiefly used by sailors, who measure soundings, etc., in fathoms.

Fatigue (fa'tēg) OF MATERIALS, injury to materials used in building or other purposes from strains or stresses exceeding the elastic limit of resistance. If, for instance, a bar of iron has an elastic limit of 20,000 lbs. per sq. inch and a breaking capacity of 50,000 lbs., and is subjected to stresses greater than 20,000 lbs., a molecular change will gradually take place in it, brittleness will supervene, and it may break at a pressure as low as 30,000 lbs. The factor of safety is, therefore, fixed by engineers within the elastic limit.

Fatimite Dynasty (fat'i-mīt), a line of caliphs claiming descent from Fatima, the favorite daughter of Mohammed, and of Ali her cousin, to whom she was married. In the year 909 Abu-Mohammed Obeidalla, giving himself out as the grandson of Fatima, endeavored to pass himself off as the Mahdi or Messiah predicted by the Koran. Denounced as an impostor by the reigning Caliph of Bagdad, he fled into Egypt, became Caliph of Tunis, and soon conquered all Northern Africa from the Straits of Gibraltar to the borders of Egypt. His son wrested Egypt from the Abbasides in 970 and founded Cairo. The Fatimite dynasty was extinguished on the death of Adhed, the fourteenth caliph, and a new line began with Saladin.

Fatty Acids, a name given to such acids as have been separated from fats. Fats and fixed oils are composed of one or more acids combined with the radical glycyl. By boiling with potash or soda the fat is decomposed, glycerin and a soap being the products. By treating this soap with hydrochloric or sulphuric acid the base is removed and the fatty acid obtained free. These acids are such as butyric, caproic, stearic, margaric, palmitic, pelargonic, valerianic, acetic, etc. Formic acid has also been included in the fatty series of acids, as it belongs to the same order as those named.

Fatty Degeneration, an abnormal condition found in the tissues of the animal body, in which the healthy protoplasm is replaced by fatty granules. It is a sign of defective nutrition, and is common in old age, affecting the muscles, the heart, arteries, kidneys, etc. It is accompanied by great muscular flabbiness, weakness, and want of energy, the sufferer looking at the same time fat and comparatively well.

Fatty Infiltration, a condition in which fat gets within the tissue cells, pushing aside the protoplasm and occupying its space. It is found in some who are inclined to obesity.

Fatty Tissue, in anatomy, the adipose tissue, a tissue composed of minute cells or vesicles, having no communication with each other, but lying side by side in the meshes of the cellular tissue, which serves to hold them together, and through which also the blood-vessels find their way to them. In the cells of this tissue the animal matter called fat is deposited.

Fatuity (fa-tū'i-ti). See *Insanity*.

Fatwa (fat'wâ), a town of Bengal, Patna District, 8 miles from Patna city, at the junction of the Punpun with the Ganges. Pop. 10,919.

Faubourg (fō-bör), a suburb of French cities; the name is also given to districts now within the city, but which were formerly suburbs without it. Thus the *Faubourg St. Germain* is a fashionable quarter of Paris in which the ancient nobility resided.

Fauces (fą'sēs; Lat. 'jaws'), in anatomy, the posterior part of the mouth, terminated by the pharynx and larynx.

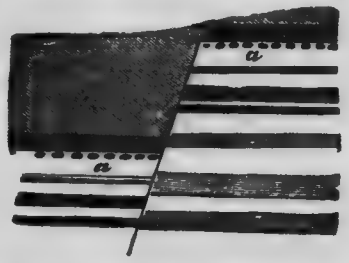
Faucet (fą'set), a form of valve or cock in which a spigot or plug opens or closes a part of a pipe for the passage of liquid.

Faucigny (fō-sē-nyē), a district of France, department of Haute Savoie, one of the loftiest districts of Europe, being partly traversed by the Pennine Alps.

Faucit (fą'sit), HELEN, LADY THEODORE MARTIN, was born in 1816, the daughter of Mrs. Faucit, the actress. She made her *début* at the Theater Royal, Richmond, in 1833, as Juliet in *Romeo and Juliet*. She first appeared in London at Covent Garden as Julia in *The Hunchback*, in which she gained a decided success. She was one of the most important members of Macready's company during the Shaksperean revivals of 1837, and was subsequently the original representative of the heroines in Lord Lytton's *Lady of Lyons*, *Money*, *Richelieu*, etc., and in Browning's *Strafford*, and *Blot on the Scutcheon*, and Colombe's *Birthday*. She married Mr. Martin (afterward Sir Theodore), and later was the authoress of a volume *On Some of Shakespere's Female Characters*. Died 1898.

Fault (falt), in geology, a fracture of strata, accompanied by a

sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance than the other. Faults are frequently met with in coal beds, the miner coming unexpectedly upon an abrupt wall of other strata. The angle this makes with the plane of the bed he



is working indicates whether he must look up or down for its continuation on the other side of the fracture. In mines these faults often serve for natural drains. The cut above shows at *a a* the change of position in strata caused by a fault.

Faun (fạn), one of a kind of rural deities or demigods believed in among the Romans, inhabiting the forests and groves, and differing little from satyrs. Their form was principally human, with a short goat's tail, pointed ears, and projecting horns; sometimes also with cloven feet. There are some famous antique statues of fauns, the *Dancing Faun* at the Uffizi in Florence (restored by Michael Angelo), the *Dancing Faun* at Naples, the *Faun* (of Praxiteles?) at the Capitoline Museum, Rome, the *Sleeping Faun*, etc.

Fauna (fạ'na; from faun, *which* see), a collective word signifying all the animals of a certain region, and also the description of them, corresponding to the word *flora* in respect to plants.

Faure (fōr), FRANÇOIS FÉLIX, statesman, born at Paris, France, in 1841; died 1899. He commanded a body of volunteers during the Franco-German war, and won the ribbon of the Legion of Honor. He was elected to the Assembly in 1881, served in several successive cabinets, and was chosen president of the French Republic in 1895.

Faust (foust), DOCTOR JOHN, a celebrated devotee of the black art, who lived in Germany early in the sixteenth century. According to some accounts he was born in Suabia, others make him a native of Anhalt, others of Brandenburg. In his sixteenth year he went to Ingolstadt and studied theology, became in three years a *magister*, but abandoned theology, and began the study of medicine, astrology, and magic, in which he likewise instructed his familiar Johann Wagner, the son of a clergyman at Wasserburg. After Dr. Faust had spent a rich inheritance, he, according to tradition, made use of his power to conjure up spirits, and entered into a contract with the devil for twenty-four years. A spirit called *Mephistopheles* was given him as a servant, with whom he traveled about, enjoying life in all its forms, but the evil spirit finally carried him off. Even yet Dr. Faustus and his familiar Wagner play a conspicuous part in the puppet-shows of Germany, and the legend forms the subject of Goethe's great drama *Faust*, and furnishes the libretto for Gounod's famous opera of the same name. As early as 1590 the legend was dramatically treated in England by Christopher Marlowe.

Fausta (fous'ta), FLAVIA MAXIMIANA, daughter of Emperor Maximinian, married in 307 A.D. to Constantine the Great. She was murdered by her husband's orders in 326 A.D.

Faustina (fous-ti'na), the name of two Roman empresses: (1) Annia Galeria Faustina (died A.D. 141), the wife of the Emperor Antoninus Pius; and (2) her daughter, who was married to the Emperor Marcus Aurelius (died A.D. 175). Both were accused of dissolute conduct.

Favart (fȧ-vär), CHARLES SIMON, creator of the serio-comic opera in France, was born in 1710, the son of a pastry cook. His poetical reputation rests principally on his numerous productions for the *opéra aux Italiens* and the comic opera. He was the director of a company of itinerant actors which followed Marshal Saxe into Flanders. His wife, Madame Favart, was a famous singer, comic actress, and dancer, and participated in the composition of her husband's plays. Favart died in 1792.

Faversham (fav'er-sham), a seaport of England, County Kent, on a branch of the Swale, giving name to a parl. div. of the county. It is a very ancient place, and has manufactures of brick, cement, and gunpowder. Faversham Creek is navigable up to the town for vessels of 200 tons. Pop. (1911) 10,619.

Favre (fȧvr), JULES, a French politician, born in 1809, at Lyons. He studied law, and after distinguishing himself at the Lyons bar, came to Paris in 1835, where he became famous as a defender of political prisoners. On the outbreak of the revolution of 1848 he became secretary to Ledru-Rollin. He

was a leader of the party of opposition to the President Louis Napoleon; and after the *coup d'état* (1851) he retired from political life for six years, till in 1858 his defense of Orsini for the attempt on the life of the emperor again brought him forward. From this time he again became an active leader of the Republican opposition to the emperor. On the fall of the empire he became Vice-president of the Government of National Defense and Minister of Foreign Affairs. As such he conducted the negotiations for peace with Prince Bismarck. He died in 1880.

Favrile (fav-ril'), a highly decorative, colored, enameled and iridescent glass, usually in vase forms. See *Tiffany, Louis Comfort.*

Favus (fā'vus), crusted or honeycombed ringworm, a disease chiefly attacking the scalp, and characterized by yellowish, dry incrustations. It is produced by a fungous growth.

Fawcett (fą'set), EDGAR, poet and novelist, born in New York, in 1847; died in 1904. He devoted himself to literary pursuits in New York and afterwards in London. He wrote *Songs of Doubt and Dream, Purple and Fine Linen, An Ambitious Woman, The New Hero,* and other novels; *Agnosticism and Other Essays,* and some successful plays.

Fawcett, HENRY, an English politician and economist, born at Salisbury in 1833. He was educated at Cambridge, studied law for a while at the Middle Temple, but soon renounced it. In 1858, when out partridge shooting, he met with an accident which inflicted on him total blindness. Undiscouraged, however, by his deprivation he gave his attention to economic studies. In 1863 he was elected to the chair of political economy at Cambridge. In 1865 he was elected M. P. for Brighton, which he represented till the general election of 1874, when he was elected for Hackney. He became postmaster-general in the second Gladstone administration, and effected many reforms in his department. In 1883 he was made Lord Rector of Glasgow University. He died Nov. 6, 1884. Amongst his principal writings are: *A Manual of Political Economy, Lectures on the Economic Position of the British Laborer,* and articles on Indian finances.—His wife, MILLICENT GARRETT FAWCETT, shared her husband's studies, and has published a work, *Political Economy for Beginners,* which is an abridgment of her husband's larger works. She is also known as a prominent advocate of all measures for the educational and political advancement of women.

Fawkes (fąks), GUY. See *Gunpowder Plot.*

Fayal (fī-ąl'), an island belonging to Portugal, one of the Azores. It is of a circular form, about 10 miles in diameter. The climate is good, and the air always mild and pure. The soil is very fertile, producing in abundance wheat, maize, flax, and almost all the fruits of Europe. It exports a great quantity of oranges and lemons. The chief place is Villa Horta or Orta. Pop. 22,262.

Fayence. See *Faïence.*

Fayette, GENERAL LA. See *Lafayette.*

Fayette, MARIE MADELEINE, COUNTESS DE LA. See *Lafayette.*

Fayetteville (fā'et-vil), a city, capital of Cumberland Co., North Carolina, on Cape Fear River, 53 miles S. of Raleigh. It has a large export trade and many cotton factories and other manufactories. Pop. 7045.

Fayoum (fą-yōm'), a province of Middle Egypt, a little to the west of the Nile, surrounded by the Libyan desert; area about 800 square miles. The soil is alluvial, and, in the north particularly fertile. Fayoum is irrigated by canals coming from the Canal of Joseph, and that from the Nile, and is one of the most fertile provinces of Egypt. Here lay the ancient Labyrinth and the artificial lake Moeris. On the west lies Lake Birket-el-Kurun. The chief town, Medinet-el-Fayoum, is connected with Cairo by a railway. Pop. of province, 371,006.

Feasts (fēsts). See *Festivals.*

Feather-grass (feth'er-gras), the popular name of *Stipa pennāta,* a native of dry places in the south of Europe. The leaves are rigid, setaceous, grooved; the awns exceedingly long, feathering to the point. The Rush-leaved Feather-grass is found in prairies in the Western States.

Feather River, a tributary of the Sacramento River, California, rising in the Sierra Nevada range. Its length is about 250 miles.

Feathers (feth'erz), the form which the dermal appendages assume in birds agreeing in mode of development, but differing in form from hairs and scales. The feather consists of a stem, horny, round, strong, and hollow in the lower part, called the *quill,* and in the upper part, called the *shaft,* filled with pith. On each side of the shaft

is a web composed of a series of regularly-arranged fibers called *barbs*. The barbs and shaft constitute the *vane*. On the edges of the barbs are set the *barbules*, which interlock with those of adjacent barbs, and thus give strength to the vane. Feathers are generally divided into two kinds, quill feathers found in the wings and tail, and plumes or clothing feathers generally covering the remainder of the bird. The feathers of birds are periodically changed, generally once, but in some species twice a year. This is called *molting*. When feathers have reached their full growth they become dry, and only the tube, or the vascular substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again; and a bird whose wings have been clipped remains in that situation till the next molting season, when the old stumps are shed and new feathers grow out. If, however, the stumps are pulled out sooner (by which operation the bird suffers nothing), the feathers will be renewed in a few weeks or even days. The feather is a very strong formation, not readily damaged, the arch of the shaft resisting pressure, while the web and fine fibers yield without suffering. Being a bad conductor of heat, it preserves the high temperature of the bird, while it is so light as to be easily carried in flight. It is rendered almost impervious to wet by the oily fluid which most birds secrete at the base of the tail. Feathers form a considerable article of commerce, particularly those of the ostrich, heron, swan, peacock, goose, etc., for plumes, ornaments, filling of beds, pens, etc.

Feather-star *Comatula rosacea*, a beautiful crinoid starfish, consisting of a central body or disc, from which proceed five radiating arms, each dividing into two secondary branches, so that ultimately there are ten slender rays. Each arm is furnished on both sides with lateral processes so as to assume a feather-like appearance. It is fixed when young by a short stalk, but exists in a free condition in its adult state.

Febricula (feb-ri-kū'la), a short, feverish attack, of undetermined cause, lasting only for a few days. See *Fever*.

Febrifuge (feb'ri-fūj), a medicine employed to drive off or diminish fever, such as quinine, sweet spirit of niter, etc.

Febronianism (fe-brō'ni-an-izm), in Roman Catholic theology, a system of doctrines antagonistic to the admitted claims of the pope, and asserting the independence of national churches, and the rights of bishops to unrestricted action in matters of discipline and church government within their own dioceses. The term is derived from Justinus *Febronius*, a *nom de plume* assumed by John Nicholas von Hontheim, Archbishop of Trèves, in a work on the claims of the pope.

February (feb'rü-a-ri; from the Roman *Februa*, a festival of expiation or purification), the second month in the year, having twenty-eight days, except in leap year, when it has twenty-nine. This latter number of days it had originally among the Romans, until the senate decreed that the seventh month should bear the name of Augustus, when a day was taken from February and added to August to make it equal July in number of days.

Fécamp (fā-kän), a seaport of France, department of Seine-Inférieure, 23 miles northeast of Havre. It is one of the best ports in the Channel, and has many vessels employed in the cod, herring, and mackerel fisheries. Pop. (1906) 15,872.

Federal Farm Loan Act, passed by Congress in July, 1916, otherwise known as the Rural Credits Bill, has for its purpose to provide funds for agricultural development in the United States. Its object is to aid farmers by creating standard forms of investment based upon farm mortgages, to equalize rates of interest upon farm loans, and in this way to open a market for the United States bonds; also to create depositories and financial agents for the United States, and for other purposes connected with the farming interests of the country. For this purpose a Farm Loan Bureau has been organized, under the general supervision of a Federal Farm Loan Board, consisting of the Secretary of the Treasury and four other members appointed by the President. For this purpose, the continental area of the United States, including Alaska, has been divided into twelve districts, each to contain a Federal Land bank, empowered to loan money to farmers on mortgage on favorable terms of interest and repayment. No such loan is to exceed fifty per cent. of the value of the land mortgaged and twenty per cent. of that of the permanent improvements thereon. The interest to be paid in such loans is in no case to exceed six per cent. per annum.

To carry out the provisions of this law corporations, known as farm land associations, may be formed of those engaged or

desiring to engage in agriculture, their purpose being to secure funds from the farm loan banks for members of the associations and to take the necessary steps to comply with the requisite conditions upon which loans can be granted. The amount to be loaned to any individual is limited to $10,000 maximum and $100 minimum, and the terms of repayment of the mortgage are so arranged as not to be onerous to the borrower.

Federal Party (fed'er-al), a name assumed by that portion of the people of the United States who favored the adoption of the Federal constitution, organized the government and administered it during the first three presidential terms. They advocated a government having attributes of sovereignty, operating upon the people directly, and having all necessary powers for effective action; their opponents favored a simple compact of confederation. The party won no presidents after 1800, and vanished during the twenty years following.

Federal Reserve Board, a banking institution centralizing and co-ordinating the banking system of the United States. Originally this system was a highly disorganized one, the currency consisting of notes issued by State banks and destitute of Federal supervision or support. This was succeeded by the National Banking System, inaugurated during the latter part of the Civil War, and with a currency based upon Government bonds deposited in the Treasury, the bank notes being thus sustained by the governmental credit. It was, therefore, entirely successful as a basis of secure circulation, but as a banking system it gradually lost its usefulness, being destitute of an elasticity in times of monetary stress. It was long felt to be inadequate as a banking system, and much expert thought was given to the problem of how best to combine it into a single and self-working system. This led, in 1913, to the passage of a bill establishing a banking and currency system known as the Federal Reserve Act, approved by the President, December 23, 1913. Under this Act the United States is divided into twelve geographical divisions, within each of which is situated a reserve banking city, as a co-ordinating center of all the national banks of that division. These twelve cities, whose districts are numbered from 1 to 12, are the following: Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco.

Every National bank is required to become a stockholder in the Reserve bank of its district, and any State bank or trust company may also become a member bank of its district by complying with certain requisite conditions. There are at the present time nearly 8000 such member banks in the United States, the largest number, nearly 1000, being in the seventh or Chicago district. Each member bank is required to subscribe to the stock of the Federal Reserve bank of its district, to the amount of 6 p. cent. of its paid-up capital stock and surplus. The Reserve bank becomes thereby a mother bank and does not do business directly with the public, as banks usually do, but in an indirect way, through the agency of the member banks. It holds a certain proportion of the reserve funds of the member banks, and also may be made a depository for Government funds. It may secure from the Treasury Government notes known as Federal Reserve notes, and is authorized to issue these against commercial paper, with a minimum gold reserve of 40 per cent. There are nearly $200,000,000 of such notes in circulation. Besides this, these banks are granted certain powers of operation in the open market, such as the purchase of commercial paper, foreign exchange, etc., and, in a general way, perform the function of clearing houses between the member banks. In this way they serve to stabilize the member banks, possessing large capital funds which can be made use of for the public benefit in times of commercial disaster or panic conditions. They are competent to serve as central balance wheels in case of disastrous conditions of this kind. The whole system is under the supervision of a central Board in Washington, known as the Federal Reserve Board, and consisting of the Secretary of the Treasury, the Comptroller of the Currency, and five members named by the President with the approval of the Senate. The total capital of the twelve banks at present is about $112,000,000, and through their operation as central banking institutions the whole financial power of the government can in times of stress be utilized for the benefit of the country at large.

Federation of Labor, American. See *Labor Organizations.*

Fee (fē), or **Fief** (fēf), in law, primarily meant a loan of land, an estate held in trust on condition of the grantee giving personal or other service to the prince or lord who granted it. Feudal estates, however, soon came to

be regarded as inalienable heritages held on various tenures; hence the term fee came to be equivalent to an estate of inheritance—that is, an interest in land which passes to heirs if the owner die intestate. The amplest estate or interest in land is that of a *fee simple*, which is also called an absolute fee, in contradistinction to a fee limited or clogged with certain conditions. A fee simple means the entire and absolute possession of land, with full power to alienate it by deed, gift, or will. It is the estate out of which other lesser estates are said to be carved; such as a *fee tail* (see *Entail*), which is limited to particular heirs, and subject to certain restrictions of use; and a *base fee*, which ceases with the existence of certain conditions.

Feeble-minded, a class of mentally defective persons, not on the whole dangerous like the insane, though contributing largely to the criminal classes. The number of feeble-minded in institutions in the United States in 1905 was 15,318; in 1910, 20,731. The total number in the United States has been estimated at 150,000. The segregation of all feeble-minded in colonies where under supervision they can do a little farming or other manual labor, is advocated, or their sterilization to prevent them from reproducing.

Feeling (fēl'ing), properly a synonym for sensation, or that state of consciousness which results from the application of a stimulus to the extremity of some sensory nerve. It is the most universal of the senses, existing wherever there are nerves; and they are distributed over all parts of the body, though most numerous on such parts as the finger tips and the lines where skin and mucous membrane pass into each other. This universal distribution of feeling is necessary, otherwise parts of the body might be destroyed without our knowledge. The structures which thus comprehend the impressions of contact are papillæ or conical elevations of the skin in which the nerves end, and which are richly supplied with blood-vessels. The term feeling is also used for a general sense of comfort or discomfort which cannot be localized, and it is thus that the disturbances of internal organs often manifest themselves. In a figurative sense the term is also applied to a mental emotion, or even to a moral conception; thus we may speak of a friendly feeling, a feeling of freedom.

Felaniche (fel-ä-nē'chā), a town in the island of Majorca, a very ancient place, with Moorish remains. Pop. 11,294.

Felegyhaza (fā'led-yĕ-sä), a town of Hungary, 66 miles S.E. of Budapest, with large cattle-markets and an extensive trade in corn, wine, and fruit. Pop. 33,081.

Felidæ (fē'li-dē), animals of the cat kind, a family of *Carnivora* in which the predaceous instincts reach their highest development. They are among the quadrupeds what the *Falconidæ* are among the birds. The teeth and claws are the principal instruments of the destructive energy in these animals. The incisor teeth are equal; the third tooth behind the large canine in either jaw is narrow and sharp, and these, the carnassial or sectorial teeth, work against each other like scissors in cutting flesh; the claws are sheathed and retractile. They all approach their prey stealthily, seize it with a spring, and devour it fresh. The species are numerous in Europe, Asia, Africa, and America, but none are found in Australia. The family comprehends the lion, tiger, leopard, lynx, jaguar, panther, chetah, ounce, serval, ocelot, cat, etc.

TEETH OF FELIDÆ.

Skull and Teeth of the Tiger. *a*, Canines or tearing teeth. *b*, Incisors or cutting teeth. *c*, True molars or grinding teeth. *d*, Carnassial or sectorial teeth.

Felix (fē'liks), ANTONIUS OR CLAUDIUS, procurator of Judea and freedman of the Emperor Claudius, is described by Tacitus as unscrupulous and profligate both in his public and private conduct. It was before this Felix that Paul's discourse (Acts xxiv, 25) was spoken. He was recalled A.D. 62, and narrowly escaped condemnation at Rome, on charges which the Jews had lodged against him.

Felix, MARCUS MINUCIUS, a distinguished Roman lawyer, who embraced Christianity, and wrote a defense of it in a dialogue entitled *Octavius*. The period when he flourished is uncertain; but Jerome is probably right in placing him about A.D. 230.

Fellah (fel'a), an Arabian word meaning 'peasant,' and used for the laboring class in Egypt. The fellahs or *fellaheen* constitute about three-fourths of the population of Egypt, and are mostly the direct descendants of the

old Egyptians, although both their language and religion are now that of their Arabian conquerors. They live in rude huts by the banks of the Nile, and have suffered much from overtaxation and oppressive rule. See *Egypt*.

Fellatah (fel-a'ta), FULBE, or FULAHS, a remarkable African race of the negro type, the original locality of which is unknown, but which is now widely diffused throughout the Soudan, where they are the predominant people in the states of Futa-Toro, Futa-Jalon, Bornu, Sokoto, etc. Though of the negro family, they have neither the deep jet color, the crisped hair, flat nose, nor thick lips of the negro. In person they are decidedly handsome, and mostly of a light copper color. They are shrewd, intelligent, and brave, and are mostly Mohammedans. Their influence is continually spreading.

Fellenberg (fel'en-burg), PHILIP EMANUEL VON, a Swiss educationalist, born in 1771. Having devoted himself to the social and intellectual improvement of the peasantry, he purchased the estate of Hofwyl, and established successively an institution for instructing the children of the poorer classes, a seminary for children in the higher grades of life and a normal school. The pupils were all trained to work in the fields or at the bench, and the product of their labor was sufficient to cover the expenses of their education. Fellenberg's scheme was ultimately so successful as to attract attention and imitation in other countries. He died in 1844, but the institutions established by him still exist in a modified form.

Fellows (fel'ōz), SIR CHARLES, traveler and antiquarian, was born in 1799 at Nottingham, England; died in 1860. He explored the valley of the Xanthus in Lycia, and discovered the remains of the cities Xanthus and Teos. His principal works are: *Travels and Researches in Asia Minor*, and *Coins of Ancient Lycia*.

Fellowship (fel'ō-ship), an honorable position in some universities, especially those of Oxford and Cambridge, which entitles the holder, called a fellow, to an annual stipend for a certain period. Fellowships in the English colleges commonly range in value from £100 to as much as £800 a year, and the right to apartments in the college, and certain privileges as to commons or meals. In American universities fellowships are regularly distinctions conferred to enable worthy students to pursue advanced graduate work, producing incomes varying from $100 to $1200.

Felo de se (fe'lō dē sē; Latin, 'a felon in regard to himself'), in law, a person that, being of sound mind and of the age of discretion, deliberately causes his own death. Formerly, in England, the goods of such a person were forfeited to the crown, and his body interred in an ignominious manner; but these penalties have been abolished.

Felony (fel'un-i), in law, includes generally all crimes below treason and of greater gravity than misdemeanors. Formerly it was applied to those crimes which entailed forfeiture of lands or goods as part of the punishment prescribed.

Fels, JOSEPH, an American single-tax reformer, born in Halifax C. H., Virginia, December 16, 1854; died February 22, 1914. He purchased 1300 acres at Hollesley Bay, England, to form a labor colony for unemployed, which has since been taken over by the government; also purchased 600 acres at Maylands, Essex, England, which was put under cultivation by small holders; was a supporter of the Fairhope Single Tax Colony at Mobile Bay, Alabama, and another colony at Arden, Delaware.

Felspar (fel'spär), FELDSPAR, a mineral widely distributed, and usually of a foliated structure, consisting of silica and alumina, with potash, soda, or lime. It is a principal constituent in all igneous and metamorphic rocks, as granite, gneiss, porphyry, greenstone, trachyte, felstone, etc. When in crystals or crystalline masses it is very susceptible of mechanical division at natural joints. Its hardness is a little inferior to that of quartz. There are several varieties, as common felspar or orthoclase, the type of an acid group containing from 7 to 16 per cent. of potash; albite and oligoclase, soda felspars, the quantity of soda exceeding that of lime; labradorite and anorthite, lime felspars, the quantity of lime in the latter amounting to 20 per cent.

Felt, a kind of cloth made of wool, or of wool and cotton united by rolling, beating, and pressure. The materials to be felted are carded and placed in a machine, where they are kept wet and intimately mixed together by a process of beating. Pressure then unites the whole into a compact mass. The use of felt as a material for hats, tents, cloaks, etc., is very ancient. For hat-making the fur of rabbits, beavers, raccoons and the wool of sheep are generally used. Felt, being a good non-conductor of heat, is much used for roofing, sheathing boilers, hot water reservoirs, etc. The

felt for such purposes is made from the coarsest woolen refuse from paper mills.

Feltre (fel'trā), a town in Northern Italy, about 44 miles N. N. W. from Venice. Pop. 5468; commune, 15,243.

Felucca (fe-luk'a), a long, narrow vessel, generally undecked, of light draught, and rigged with large lateen sails. They also carry from eight to twelve large oars. They are common in the Mediterranean.

Feme Covert (fem kuv'ert), in law, signifies a married woman, in contradistinction to a *feme sole*, or single woman.

Femern (fā'mèrn), an island of Prussia, province of Schleswig-Holstein, separated from the mainland by a shallow strait about 1 mile broad. The island has a fertile but marshy soil. The inhabitants are chiefly agriculturists and fishers. Pop. about 10,000.

Femgerichte, FEHMGERICHTE, or VEHMGERICHTE (fām'ge-rih-te; from Old German, *fem*, punishment, and *gericht*, a court), criminal courts of Germany in the middle ages, which took the place of the regular administration of justice (then fallen into decay), especially in criminal cases. These courts originated and had their chief jurisdiction in Westphalia, and their proceedings were conducted with the most profound secrecy. They seem to have been a survival of old territorial jurisdictions which, on the general distraction and lawlessness prevalent after the fall of Henry the Lion (1182), acquired an extensive and tremendous authority. In process of time, however, they degenerated, and no longer confined themselves to law and precedent, so that the secrecy in which they enveloped themselves only served as a cloak to their criminal purposes. The flagrant abuse of their power brought about their fall. In 1461 various princes and cities of Germany, as well as the Swiss confederates, united in a league against them, but their influence was not entirely destroyed until an amended form of trial and penal judicature was introduced. The last Femgericht was held at Zell in 1568. The president of the secret tribunal was called the Freigraf, and was generally a prince or count. His associates, who concurred in and executed the sentence, were called *Freischöffen*. These were scattered through all the provinces of Germany, and recognized one another by certain signs and watchwords. They acknowledged the emperor as their superior, and for this reason generally made him one of their number at his coronation at Aix-la-Chapelle. The assemblies of the tribunal were open or secret. The former were held by day in the open air; the latter by night, in a forest or in concealed and subterranean places. In these different cases the circumstances of judgment and the process of trial were different. The crimes of which the secret tribunal usurped cognizance were heresy, sorcery, rape, theft, robbery, and murder. The accusation was made by one of the Freischöffen, who, without further proof, declared upon oath that the accused had committed the crime. The accused was now thrice summoned to appear before the secret tribunal, and the citation was secretly affixed to the door of his dwelling or some neighboring place; the accuser remained unknown. If, after the third summons, the accused did not appear, he was once more cited in a solemn session of the court, and if still contumacious, was given over to the Freischöffen. The first Freischöffe who met him was bound to execute the decree of the court. A dagger was left by the corpse to show that it was not a murder, but a punishment inflicted by one of the Freischöffen. That many judicial murders were perpetrated in this manner from revenge, interested motives, or malice may justly be imagined.

Femur (fē'mur), in vertebrate animals, the first bone of the leg, situated next the trunk of the body, and in man popularly called the thigh-bone.

Fen, a marsh or stretch of wet boggy land often containing extensive pools. The *Fens*, or the *Fen District*, is a special term for a marshy district of England, extending into the counties of Cambridge, Lincoln, Huntingdon, Northampton, Norfolk, and Suffolk. A great part of the district is known as Bedford Level. Much of the land has been reclaimed at vast expense. The soil of fen lands is generally black and rich to a depth of 2 or 3 feet, and with proper management in the matter of draining they will produce heavy crops of grass and corn. There are some fens around Boston, Mass.

Fences (fen'ses), continuous lines of obstacles artificially interposed between one portion of the surface of the land and another for the purpose of separation or exclusion. Live fences are made of hawthorn, holly, box, beech, etc.; dead fences of stone, wood, and in recent times of iron or wire. In agriculture fences are necessary both for restricting the tenant's own animals to their pasture and for protecting his land from straying animals. The general

erection of fences on farms is one of the improvements of modern agriculture.

Fencibles (fen'si-blz), a sort of local militia raised for defense in case of invasion, and not liable to be sent to serve out of the country. The term *volunteers* is now used for this kind of service. The State Fencibles of Philadelphia is an old and honorable body of local militia.

Fencing (fens'ing), the art of attack and defense with sword or rapier, no shield being used. It was in Italy in the sixteenth century that the skillful use of the small sword first became common. The art spread to Spain and then to France, where, on account of the prevalence of dueling, it was brought to a high degree of development. The small sword or rapier (which was adopted for dueling) has a point, but no edge, and therefore demands the highest degree of adroitness in its use. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel and has a button at the end in place of a point. The parries are made with the weapon itself by opposing the *forte* of the foil (*i. e.*, the strong part from the handle to the center) to the *feeble* of the adversary's foil (*i. e.*, to the part from center to point); the upper part of the body to the right is defended by the parry called *tierce*, the upper part to the left by the *carte*, and the lower part by the *seconde*. In all parrying care must be taken that in covering the side attacked the other side is not too carelessly exposed to the enemy. After every parry a return should be made with rapidity and decision. The fencer should rely more upon his sword hand for protection than upon his agility of leg; yet he must be active on his legs so as to advance, retreat, or lunge with effect. The knees should therefore be somewhat bent when the fencer is on guard, that he may be light and elastic in his movements. An attack may be made by the mere extension of the arm, or accompanied by a lunge, that is, by advancing the body, stepping forward with the right foot without moving the left. An *engagement* means the crossing of the blades; a *disengagement*, slipping your foil under the opponent's and then pressing in the opposite direction; *riposte*, the attack without pause by a fencer who has parried. Fencing with the broadsword differs essentially from that with the foil, as the former has an edge as well as a point, and is therefore meant to cut as well as thrust. According to the instructions of drillmasters there are seven cuts, with corresponding guards, and three thrusts. Cut *one* is a diagonal, downward cut at the left cheek of the adversary; cut *three* is delivered with an upward slope at the left leg, and cut *five* horizontally at the right side; cuts *two*, *four*, and *six* attack the right cheek, right side, and right leg, respectively; and cut *seven* is directed vertically at the head. Guards *one* and *two* defend the upper portion of the body, the sword sloping upwards in an opposite direction to the opponent's guards; *three* and *four* protect the legs, the sword sloping downwards; guards *five* and *six* defend the sides, when the sword is held vertically, point downwards; and guard *seven* protects the head, the blade meeting the enemy's almost at a right angle. Since the introduction of the bayonet, bayonet exercise has become an important department of fencing in the army. In handling the bayonet defensively the right foot is thrown back and receives most of the weight of the body, the knees are bent, the bayonet brought to a horizontal position level with the waist. This is the 'guard,' and according to the parry to be made the weapon is carried either to the 'high' position, pointing upwards from the breast, or to the 'low' position, pointing downwards from the breast. In taking the offensive the right leg is straightened, and the left bent forward, without moving the feet from their place. The butt of the rifle is pressed firmly to the shoulder and points straight forward. In 'shortening arms' the butt is carried back to the full extent of the right arm, while the barrel (turned downwards) rests upon the left arm. The body rests upon the right leg, which is slightly bent, while the left is somewhat advanced.

Fénelon (fān-lōn'). FRANÇOIS DE SALIGNAC DE LA MOTHE, one of the most venerable of the French clergy, born in 1651 at the Château Fénelon, in Périgord, of a family illustrious in church and state. A gentle disposition, united with great vivacity of mind and a feeble and delicate constitution, characterized his youth. He was educated under the eye of his uncle, the Marquis of Fénelon, and afterwards at St. Sulpice, Paris. He took orders at the age of twenty-four, and distinguished himself in the work of converting Protestants. In 1681 his uncle conferred on him the priory of Carennac. Soon after he wrote his first work, *Traité de l'Éducation des Filles*, which was the basis of his future reputation. In 1689 Louis XIV entrusted to him the education of his grandsons, the Dukes of Burgundy,

Anjou, and Berri. In 1694 he was created Archbishop of Cambray. A theological dispute (see *Quietism*) with Bossuet, the virtual head of the French Church, terminated in his condemnation by Pope Innocent XII, and his banishment to his diocese by Louis XIV. Fénelon submitted without the least hesitation, and thenceforward lived contentedly in his diocese, sustaining the venerable character of a Christian philosopher, and scrupulously performing his sacred duties. He died in 1715. He left numerous works in philosophy, theology, and belles-lettres. The most celebrated is *Les Aventures de Télémaque*, in which he endeavored to exhibit a model for the education of a prince. It was commonly taken for a satire on the reign of Louis XIV, though nothing, probably, was further from the mind of Fénelon.

Fenians (fē'li-ans), a name usually derived from Fionn or Finn, the name given to a semi-mythical class of Irish warriors famous for their prowess. The name has been assumed in recent years by those Irish who formed a brotherhood in their own country and in America, with the intention of delivering Ireland from the sovereignty of England, and establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was organized in the United States; and its chief council, consisting of a 'head-center,' John O'Mahony, and five other members, which had its seat at New York, soon had branches in every state of the Union, while at the same time large numbers joined the cause in Ireland, where James Stephens was 'head-center.' The close of the American Civil war, when large numbers of trained Irish soldiers who had taken part in the war were released from service, was thought to be a convenient time for taking some decisive steps. Two risings were planned in Ireland, but they were both frustrated by the energetic measures of the British government, the first, in September, 1865, by the seizure of the office of the *Irish People*, the Fenian journal published at Dublin, in which papers were found which revealed to the government the secrets of the conspiracy, and which led to the capture of the ringleaders, Luby, O'Leary, O'Donovan Rossa, and others; the second, in February, 1866, was as speedily suppressed by the suspension of the Habeas Corpus Act in Ireland. An invasion of Canada from New England, attempted in the same year, failed as miserably as the attempt in Ireland, and convinced the Irish that they could not expect the aid from the American people on which they hitherto counted. At last, on March 5, 1867, the long-prepared insurrection broke out almost simultaneously in the districts of Dublin, Drogheda, and Kerry. The number of insurgents in the field, however, did not exceed 3000, and though they burned some police stations, they nowhere faced the troops sent after them. About the same time some forty or fifty Irish-Americans landed in a steamer near Waterford, but soon after fell into the hands of the police. In 1870 and 1871 two raids were again made on Canada, but both were ridiculous failures, the first being repulsed by the Canadian Volunteers, and the second suppressed by the United States government. The modern Irish nationalist party is known as the Sinn Fein (q. v.).

Fenne, George Manville, an English author, born at Pimlico in 1831; died in 1909. He became a successful sketch writer, following this up with a large number of boy's stories, some of them very successful. He also wrote numerous novels and Christmas stories, with several dramas and farces, being among the most voluminous of modern writers.

Fennec (fen'ek; *Canis zerda*), a small animal allied to the dog and fox, and sometimes called the Sahara fox, being a native of that region. It lives on birds, jerboas, lizards, dates, etc., burrows with great facility, and is easily tamed. It is fox-like in appearance, and is remarkable for the great size of its ears.

Fennel (fen'el), a fragrant plant, *Fœniculum vulgare*, cultivated in gardens, belonging to the nat. order Umbelliferæ. It bears umbels of small yellow flowers, and has finely-divided leaves. The fruit, or in common language the seeds, are carminative, and frequently employed in medicine.—*Giant fennel* is a popular name for *Ferula communis*, which attains sometimes a height of 15 ft.

Fenugreek (fēn'ū-grēk), a leguminous plant, *Trigonella Fœnum græcum*, whose bitter and mucilaginous seeds are used in veterinary practice. It is an erect annual, about 2 ft. high, a native of the south of Europe and of some parts of Asia.

Feodor (fā'o-dor), the name of three Russian princes—Feodor I, son of Ivan the Terrible, reigned from 1584-98. He was a feeble prince, who allowed himself to be entirely governed by his brother-in-law, Boris Godunov. With him the Russian dynasty of Rurik became extinct.—Feodor II, son of

Boris Godunov, reigned only for a short time in 1605.—Feodor III, the son of Czar Alexis, reigned from 1676-82, warred with the Poles and Turks, and, by the peace of Baktschisarai, obtained possession of Kiev and some other towns of the Ukraine.

Feodosia (fe-a-dō'sē-ya; formerly Kaffa), a town in Russia, in the southeast of the Crimea. From 1266 to 1474 this town was in possession of the Genoese, in whose hands it became the seat of an extensive commerce with the East, and is said to have had a population of 80,000. It is still one of the most important towns in the Crimea. Pop. 27,238.

Feoffment (fef'ment), in law, that mode of conveying property in land where the land passes by livery in deed, that is, actual delivery of a portion of the land, as a twig or a turf; or when the parties, being on the land, the feoffer expressly gives it to the feoffee. As the statute of uses has introduced a more convenient mode of conveyance, feoffments are now rarely used except by corporations. See *Seisin, Seisin.*

Feræ naturæ (fē'rē na'tu-rē; 'of a wild nature'), the name given in the Roman law to beasts and birds that live in a wild state, as distinguished from those which are *domitæ naturæ*, that is, tame animals, such as horses, sheep, etc. The right of property in such animals exists only as long as they are in a state of confinement or within the boundaries of the possessor's lands, unless it can be proved that any special animal had been trained to return to its master's property.

Fer-de-lance (fêr-de-läns), the lance-headed viper or *Craspedocephălus* (*Bothrops*) *lanceolātus*, a serpent common in Brazil and some of the West Indian Islands, and one of the most terrible members of the rattlesnake family (Crotalidæ). It is 5 to 7 ft. in length. The tail ends in a horny spine which scrapes harshly against rough objects but does not rattle. Its bite is almost certainly fatal.

Ferdinand (fêr'di-nand), German emperors:—1. Ferdinand I, brother of Charles V, and born at Alcala, in Spain, 10th March, 1503. In 1522 he received the Austrian lands of the house of Hapsburg from the emperor, to which were afterwards added the kingdoms of Hungary and Bohemia in right of his wife Anna of Hungary. On the abdication of Charles he succeeded to the imperial title. He died in 1564.—2. Ferdinand II was born in 1578, and succeeded his uncle Matthias as Emperor of Germany in 1619. He was of a dark and reserved character, and had been brought up by his mother and the Jesuits in fierce hate of Protestantism. The result was a quarrel with his Bohemian subjects, who openly revolted and offered the Bohemian crown to the Elector Palatine, a step which led to the outbreak of the Thirty Years' war (1619). (See article under that head.) With the help of the Catholic League and John George, Elector of Saxony, he was placed firmly on the throne of Bohemia, where he relentlessly persecuted the Protestants. He died in 1637.—3. Ferdinand III, son of the preceding, was born in 1608, and succeeded his father in 1637. He had served in the Thirty Years' war and had seen the miseries which it occasioned and was reluctant to continue it. There were eleven years more of it, however, before the Peace of Westphalia was concluded in 1648. Ferdinand died in 1657.

Ferdinand V, King of Aragon, who received from the pope the title of *the Catholic*, on account of the expulsion of the Moors from Spain, was the son of King John II, and was born March 10, 1453. On the 18th of October, 1469, he married Isabella of Castile, and thus brought about that close connection between Aragon and Castile which became the basis of a united Spanish monarchy and raised Spain to pre-eminence amongst European states. After a bloody war of ten years they conquered Granada from the Moors (1491); but the most brilliant event of their reign was the discovery of America, which made them sovereigns of a new world. (See *Columbus.*) This politic prince laid the foundation of the Spanish ascendency in Europe by the acquisition of Naples (1503), and by the conquest of Navarre (1512); but his policy was deceitful and despotic. He instituted the court of the Inquisition at Seville in 1480, and, to the great injury of Spanish commerce, expelled the Jews (1492) and Moors (1501). He died in 1516.

Ferdinand I, of Bourbon, King of the Two Sicilies (previously Ferdinand IV of Naples), born January 12, 1751, was the third son of Charles III, King of Spain, whom he succeeded in 1759, on the throne of Naples, on the accession of the latter to that of Spain. In 1768 he married Maria Caroline Louisa, daughter of the Empress Maria Theresa, who soon acquired a decided influence over him. After the death of Louis XVI Ferdinand joined the coalition against France, and

took part in the general war from 1793 to 1796; but in 1799, after the defeat of the Neapolitans under Gen. Mack, the French took possession of the whole kingdom, and proclaimed the Parthenopean Republic. The new republic did not last long, and Ferdinand returned to power in 1800. Six years later he was again driven from Naples by the French. The Congress of Vienna finally re-established Ferdinand in all his rights as King of the Two Sicilies in 1814, while Naples was still occupied by Murat. But after the flight of the latter in March, 1815, Ferdinand once more entered Naples. In 1820, in consequence of a revolution, Ferdinand was obliged to swear to support a new and more liberal constitution, but with the help of Austria he soon set up a despotic monarchy. He died in 1825, and was succeeded by his son, Francis I.

Ferdinand II, grandson of the preceding and King of the two Sicilies, who succeeded his father, Francis I, in 1830, was born in 1810 and died in 1859. He was nicknamed Bomba, from the bombardment of his palace in 1849. He was succeeded by his son, Francis II.

Ferdinand, King of Roumania, was born in 1865 and succeeded to the throne of Roumania in 1914, following the death of his uncle, Charles I, a few months after the outbreak of the Great war. Although a Hohenzollern, his sympathies were with the Allies, and in 1916 he declared war on the Central Powers.

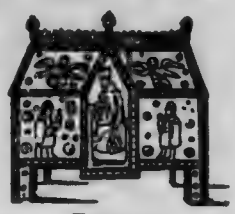
Ferdinand I, Czar of Bulgaria, was born in Vienna in 1861. Prince Ferdinand was elected by the Bulgarian parliament as the successor of Alexander of Battenburg in 1887 and assumed the title of Czar in 1908, when Bulgaria proclaimed her independence from Turkey. He was an active leader in the Balkan wars and in the European war, which Bulgaria entered on the side of Germany in 1915.

Ferdinand VII, King of Spain, eldest son of Charles IV, and of Maria Louisa of Parma, born in 1784; ascended the throne in March, 1808, when a popular rising forced his father to abdicate in his favor. A month later he himself abdicated in favor of Napoleon, who conferred the crown on his brother Joseph. Ferdinand returned to Spain in March, 1814. His arbitrary conduct caused an insurrection in 1820, which was at first successful, but Louis XVIII of France having sent an army to his aid, his authority was once more made absolute in Spain. Having no sons, he abolished the act of 1713 by which Philip V had excluded women from the throne of Spain, and then left his crown to his daughter Isabella to the exclusion of his brother, Don Carlos. It was during the reign of this king that the Spanish colonies in America broke away from the mother country.

Ferdinandea (fêr-di-nand'e-a). See *Graham Island.*

Fère (fâr), La, a town of N. E. France, department of Aisne, at the confluence of the Serre and the Oise, a fortress of the second rank. Pop. 3083.

Ferentino (fâ-ren-tē'nō), a town in Central Italy, 6 miles northwest of Frosinone. It has remains of ancient walls, built of hewn stone without mortar. Pop. 12,270.



Feretory.

Feretory (fĕr'e-tu-ri), a kind of box made of gold or other metal, or of wood variously adorned, and usually in the shape of a ridged chest, with a roof-like top, for containing the relics of saints. It is borne in processions.

Ferghana (fêr-gä'na), a province of Asiatic Russia in Turkestan, formed in 1876 out of the conquered khanate of Khokand. It consists mainly of a valley surrounded by high ranges of mountains and traversed by the Sir-Darya and its tributaries; area, 36,000 sq. miles. The climate is warm, and the soil in part fertile, but a considerable portion of the country is desert. Pop. 1906 est., 1,796,500. Khokand is the capital.

Fergus Falls, a city, capital of Otter Tail Co., Minnesota, on the Red River of the North. It has flour and woolen mills, ironworks, and other industries and a State hospital for the insane. Pop. 6887.

Ferguson (fĕr'gŭ-son), Adam, a Scottish historical and political writer, born in 1724; died in 1816. In 1757 he succeeded David Hume as keeper of the Advocates' Library, Edinburgh, in 1759 was made professor of natural philosophy in the university, and in 1764 of moral philosophy. He resigned his chair in 1784. Among his chief works are an *Essay on Civil Society* (1767), *Institutes of Moral Philosophy* (1769), *History of the Roman Republic* (1783), etc.

Ferguson, James, an eminent experimental philosopher,

mechanist, and astronomer, was born of poor parents at Keith, in Banffshire, in 1710. While a boy tending sheep he acquired a knowledge of the stars, and constructed a celestial globe. With the help of friends he went to Edinburgh, where he studied mathematics and drawing, making such rapid progress in the latter that he was able to support himself by taking portraits in miniature. In 1743 he went to London, where he painted and gave lectures in experimental philosophy. Amongst his hearers was George III, then Prince of Wales, who afterwards settled on him a pension of £50 a year. He died in 1776. His principal works are: *Astronomy Explained upon Sir Isaac Newton's Principles* (1756); *Lectures on Mechanics, Hydrostatics*, etc. (1760), and *Select Mechanical Exercises* (1773).

Ferguson Bequest, a Scottish fund named from John Ferguson, a native of Irvine, who died in 1856, leaving about £500,000 for philanthropic purposes. Of this, £400,000 were set apart as a fund for aiding in the erection of churches and schools, supplementing the income of ministers, missionaries, and teachers of schools, and maintaining public libraries. Only *quoad sacra* Established Churches, Free, United Presbyterian, and Congregational Churches share in the benefits. The Ferguson Scholarships in classics, mathematics, and philosophy respectively, one in each subject annually open to competitors from all the Scotch universities, were also founded by him.

Fergusson (fèr'gus-on), James, a writer on architecture, born at Ayr in 1808. He went out to India as partner of an important commercial house, but after some years retired from business to devote himself to the study of architecture and early civilizations. In 1845 he published *Illustrations of the Rock-cut Temples of India;* in 1849, *A Historical Enquiry into the True Principles of Beauty in Art;* in 1851, *The Palaces of Nineveh and Persepolis Restored;* in 1855, *Illustrated Handbook of Architecture;* in 1862, *History of the Modern Styles of Architecture*, a sequel to the handbook, both being afterwards combined in *History of Architecture in All Countries* (3 vols. 1865-67), and completed by a *History of Indian and Eastern Architecture* (1876). He also wrote on the site of the Holy Sepulchre at Jerusalem; *Tree and Serpent Worship; Rude Stone Monuments in All Countries*, etc. He died in 1886.

Fergusson, Robert, a Scottish poet of distinguished merit, was born at Edinburgh, October 17, 1750. He was educated at St. Andrews University, and became clerk to a writer of the signet in Edinburgh. He wrote poems, of which those in the Scottish dialect have genuine poetic excellence. Social excesses, into which he was led, impaired his feeble constitution, and brought on disease, which terminated his existence in 1774. He was buried in the Canongate Churchyard, Edinburgh, where Robert Burns erected a monument to the memory of his kindred genius, to whom he owed suggestions for several of his own poems.

Ferish'ta, more properly Mohammed Kasim, a Persian historian, born at Astrabad about 1550. He went to India with his father, and was for some time the tutor of a native prince. He wrote a history of the *Mohammedan Power in India*, which is the best yet written on the period which it embraces. He died about 1612.

Fermanagh (fer-mă'nâ), an inland county in Ireland, in the province of Ulster; area, 714 sq. miles. The county is divided lengthwise into two nearly equal portions by Lough Erne, and exhibits a succession of abrupt eminences of slight elevation, but is mountainous towards its western boundary. The soil is variable, and not remarkably fertile. The manufactures are unimportant. Politically it is divided into North Fermanagh and South Fermanagh, each sending one member to Parliament. Pop. 65,430.

Fermentation (fer-men-tā'shun), the spontaneous conversion of an organic substance into new compounds by the influence of a ferment, these ferments being apparently vegetable organisms of extremely simple type, which by their life, growth, and increase set up the changes. There are several kinds of fermentation: 1st, the *vinous* or *alcoholic* fermentation—the most important from an economic and industrial point of view—in which the sugar contained in liquids is converted into alcohol, carbonic acid, and glycerin; 2d, the *acid* fermentation, in which spirituous liquors become acid, producing acetic acid; 3d, the *putrid* fermentation, by which organic substances undergo various alterations according to the nature of the substance, and generally set free poisonous gases. Fermentation is also described as lactic, butyric, etc., according to the nature of the results. The general course of alcoholic fermentation, as seen in brewing and wine making, is as follows: After a lapse of time, which may vary much according to the temper-

ature and other conditions, the liquid acquires a turbid appearance, there is a slight disengagement of gas, which increases till the liquid begins to effervesce, its temperature rises to a higher point than that of the surrounding air, and its surface becomes covered with a frothy matter known as yeast. The effervescence becomes more and more violent till a climax is reached, when its intensity gradually diminishes, and the disengagement of gas ceases. The yeast then settles down at the bottom of the liquor, which is now entirely deprived of its sugar, and has the characteristic taste and effects of 'fermented liquors.' The rationale of this process has long been the subject of much discussion, but there can be little doubt that it is due to microscopic organisms (the yeast fungus) which live and multiply in the liquid in which they cause fermentation. And the fermentation may be checked or altogether prevented by anything which prevents the growth of the fungus, for example by the presence of any antiseptic substance such as sulphuric acid, carbolic acid, etc., which acts as a poison on the fungus; or by the liquid being either too hot or too cold (below 50° or above 86° Fahr.). Fermentation differs in kind according to the nature of the substance which produces it, and each kind is the special production of a certain species of organism, no two of which will ever pass into each other. *Lactic fermentation*, such as occurs in milk that has been allowed to stand, is caused, according to Pasteur, by the development in the mass of a microscopic fungus, *Penicillium glaucum*, the sugar of the milk being converted into lactic acid. The *acid* or *acetous fermentation* occurs in liquids which have already undergone vinous fermentation. When exposed to the atmosphere such liquids become sour, and vinegar is produced. This change is probably due to the growth of a fungus, *Mycoderma aceti* (the vinegar plant). *Viscous fermentation* often accompanies vinous fermentation, making the wine thick and viscous so that it runs out in threads when poured. It occurs at temperatures ranging from 68° to 104° Fahr. *Butyric fermentation* follows on lactic fermentation when the latter is allowed to proceed after lactate of lime has been formed. It is believed that putrefaction is only a species of fermentation, determined by ferments of the bacterial class. As it is commonly maintained that fermentation may be set up by the necessary germs entering the liquors from the air in which they float, the theory of fermentation has a close connection with that of the germ theory of disease. See *Germ Theory*.

Fermented Liquors (fėr-ment'ed), alcoholic beverages obtained by the fermentation and clarification of saccharine fluids. These have been in use from the earliest times. Among the commonest kinds are *wine* made from the juice of the grape; *ale* or *beer* made from an infusion of malt; *cider*, from apples; *mead*, from honey; *kumiss* made by the Kirghis from mares' milk; *chica* from maize by the South American Indians, etc. From all fermented liquors a spirit may be extracted by distillation.

Ferments (fėr'ments), certain substances which, under particular conditions, excite fermentation. Some are of inorganic nature, but the most important are organic. See *Fermentation*.

Fermo (fėr'mō), a town of Middle Italy, province of Ascoli, on a height about 4 miles from the Adriatic, on which is its port, Porto di Fermo. Pop. 16,577, commune 20,542.

Fermoy (fėr-moi'), a town in Ireland, County Cork, on the Blackwater. It contains Fermoy College and St. Colman's Roman Catholic College, and has barracks accommodating 3000 men. It has large flourmills and a considerable trade in corn. Pop. 6454.

Fernando de Noronha (fer-nan'dō de noron'yâ), a small island in the Atlantic forming one of a small group of same name about 210 miles from the coast of Brazil, to which it belongs, and by which it is used as a penal settlement. It is defended by forts. The group is essentially volcanic in character; the vegetation of the tropical American type, remarkable for the immense number of creepers which festoon the trees. A scientific expedition was sent out by the British Government in July, 1887, to investigate the group.

Fernan'do Po, a Spanish island in the Bight of Biafra, off the west coast of Africa, about 20 miles from the mainland. It is of volcanic origin, and is of an oblong form, broadest at the south extremity, 35 miles long and 22 miles broad. It is traversed from north to south by a ridge of mountains terminating in a magnificent cone, 11,040 feet high, called Clarence Peak. The island is picturesquely covered with forests and luxuriant vegetation, chiefly palms and the bombax or silk-cotton tree. There are several harbors in the island. The population numbers about 20,000, and is composed partly of a mix-

ture of negroes, Portuguese, and other Europeans, partly of native-born negroes. The capital is Clarence Town.

Ferney (fer-nā), a frontier village in France, dep. Ain, 1½ miles north of Geneva, celebrated as the chief residence of Voltaire from about 1760 to 1778. Pop. 1163.

Ferns (*Filices*), a natural order of cryptogamous or flowerless plants, forming the highest group of the acrogens or summit-growers. They are leafy plants, the leaves, or more properly fronds, arising from a rhizome or root-stock, or from a hollow arborescent trunk, and being circinate in vernation, a term descriptive of the manner in which the fronds are rolled up before they are developed in spring, having then the appearance of a bishop's crosier. On the veins of their lower surface, or their margins, the fronds bear small vessels named *sporangia*, containing spores. These spore-cases are arranged in clusters, named *sori*, which are either naked or covered with a layer of the epidermis, which forms an involucre or indusium. When the spores germinate they produce a cellular structure of a leafy description, called the *pro-embryo*, or *prothallus*, upon which are developed organs which have received the names of *antheridia* and *archegonia*. When produced upon the *prothallus* these organs do not immediately give origin to a germinating spore, but from their mutual action proceeds a distinct cellular body, destined at a later period to develop into a fruit-bearing frond. Ferns have a wide geographical range, but are most abundant in humid temperate and tropical regions. In the tropical forests the tree-ferns rival the palms, rising sometimes to a height of 50 or 60 feet. Ferns are very abundant as fossil plants. The earliest known forms occur in Devonian rocks. Various systems of classification for ferns have been proposed. At present the order is usually divided into six or eight sub-orders or tribes distinguished by differences in the structure of the sporangium. The generic characters are founded on the position and direction of the sori and on the venation. The largest division is that of the Polypodiaceæ, to which belong the bracken, the maidenhair, the hart's-tongue fern, the lady-fern, etc. The royal fern, however, belongs to the Osmundaceæ. A few of the ferns are used medicinally, mostly as demulcents and astringents. The species known as male fern acts to expel tapeworms. Some ferns yield food. *Pteris esculenta* is the edible bracken of New Zealand.

Ferozepoor. See *Firospur*.

Ferrara (fĕr-rä'ra), a city of N. Italy, capital of the province of same name, 26 miles N. N. E. of Bologna, in a fertile but unhealthy plain. It is a well-built town with many remains of the splendor and commercial prosperity it enjoyed under the house of Este, from the fourteenth to the seventeenth century. The old ducal palace, the cathedral, the public picture gallery, the houses where Ariosto and Guarini lived, and a monument to Savonarola, who was born here, are among the many interesting monuments which Ferrara contains. Pop. 32,968. The province was formerly a duchy of Italy held by the House of Este as a papal fief from 1471 till 1547, when it fell to the pope. (See *Este*.) At the unification of Italy under Victor Emmanuel in 1860 it gave its name to a province bounded on the N. by the Po, E. by the Adriatic, S. and W. by Ravenna, Bologna, and Dodena; area, 1100 square miles; population, 271,726.

Ferrari (fĕr-rä'rē), GIUSEPPE, an Italian philosopher, born, 1812; died, 1876. Among his principal writings are: *La Filosofia della Rivoluzione*, and *Corso d'istoria degli scrittori politici Italiani*.

Ferreira (fer-ā'i-rā), ANTONIO, a Portuguese poet, founder of the classical school, born at Lisbon in 1528; died in 1569. His *Ines de Castro* was one of the earliest tragedies in Europe.

Ferrel, WILLIAM, an American meteorologist, born in Bedford (now Fulton) county, Pa., graduated at Bethany College, Va., in 1844. He was especially appointed to the U. S. Coast Survey for tidal observation, 1867-82, and was connected with the U. S. Signal Service. He invented the maxima and minima tide-predicting machine, and his meteorological attainments attracted attention both in America and abroad.

Ferrel's Law, a meteorological generalization propounded by William Ferrel, that the deflecting force exerted on the winds by the rotation of the earth is inversely proportionate to the velocity of motion. This force deflects the winds in the northern hemisphere to the right and those of the southern hemisphere to the left.

Ferrer, J. GUARDIA FRANCISCO, teacher and anarchist, born at Abella, Barcelona province, Spain, in 1859. The son of a poor farmer, he received the education of a peasant, yet early showed unusual mental powers. He imbibed radical ideas, and at the age of 14 gave deep offense by drinking the

wine intended for sacramental purposes. At 26 he took part in an insurrection and had to seek refuge in Paris. After fifteen years he returned to Spain and settled in Barcelona. He had been enriched by a legacy of about $200,000, and with the aid of this he equipped a press for the printing of works of anticlerical literature. He also became a teacher and one of extraordinary ability. He founded what he called the Modern School, in which the most liberal and anarchistic sentiments were taught. This led, on September 1, 1909, to his arrest on the charge of being an instigator of the revolutionary outbreak in Barcelona at that time. He was hastily and secretly tried, adjudged guilty, and executed on the 13th. This act was imputed to the hatred of the clergy, and excited indignation among the apostles of free thought throughout Europe and America.

Ferrero (fe-rā'rō), Guglielmo, an Italian historian and man of letters, born in 1872 at Portici, near Naples. He has lectured widely in Europe and America, and his works are well known, especially his *Greatness and Decline of Rome*. This throws new light on Roman history and points out striking analogies between Roman and modern conditions. Other works are *Symbols* and *The Female Offender* (in collaboration with Lombroso).

Ferret (fer'et; *Putorius* or *Mustela furo*), a carnivorous animal closely allied to the polecat, about 14 inches in length, of a pale-yellow color,

Ferret (*Mustela furo*).

with red eyes. It is a native of Africa, but has been introduced into Europe and America. It cannot bear cold or subsist, even in France, except in a domestic state. Ferrets are used, in catching rabbits, to drive them out of their holes, and to drive away rats in the same manner.

Ferrier (fer'i-ėr), David, a Scotch physician, born at Aberdeen in 1843, and became a professor in King's College, London, in 1873. His researches in the brain and success in localising its functions attracted great attention, and our knowledge of the conditions of brain disease, epilepsy, etc., are largely due to his labors. His discoveries are told in *The Functions of the Brain* (1876), and *The Localization of Cerebral Disease* (1879).

Ferrier, James Frederick, a Scotch metaphysician, born at Edinburgh in 1808; died at St. Andrews in 1864. After studying at Edinburgh and Oxford he was admitted to the Scottish bar in 1832, but gave his attention more to literature than to law. His contributions to *Blackwood's Magazine*, then at the height of its fame, brought him into notice, and in 1845 he was appointed to the chair of moral philosophy at St. Andrews. His chief work is the *Institutes of Metaphysic*, in which he attempts to build up in a rigorously logical and deductive method a complete system of knowing and being.

Ferris Wheel, The, exhibited at the Chicago World's Fair, was a remarkable engineering feature. Its diameter was 270 ft.; its circumference 825 ft. Its highest point was 280 ft. The axle was a steel bar, 45 ft. long, 32 inches thick. Fastened to each of the twin wheels was a steel hub 16 ft. in diameter. The 36 cars on the wheel each comfortably seated 40 persons, wheel and passengers weighing 1200 tons. The two towers at the axis supporting the wheel were 140 ft. high. The motive power was a 1000 horse-power steam engine under the wheel. By the Ferris wheel the almost indefinite application of the tension spoke to wheels of large dimensions has been vindicated, the expense being far smaller than that of the stiff spoke. It has been imitated at later exhibitions. Its builder, George W. Ferris, an able engineer, was born at Galesburg, Illinois, in 1854; died in 1896.

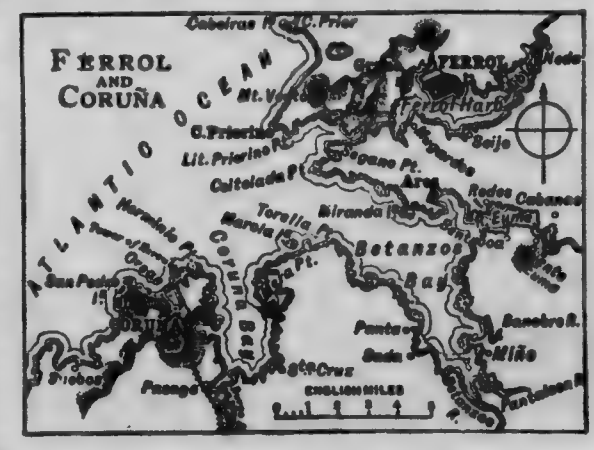
Ferro (fėr'rō), or Hierro, the most southwestern and smallest of the Canary Islands, about 18 miles long and 9 miles broad. This island having once been supposed the most western point of the Old World, was formerly employed by all geographers to fix their first meridian, and the longitude reckoned from it. As first meridian its conventional place is 20° W. of Paris and 17° 40′ W. of Greenwich. It is still occasionally used by German geographers.

Ferrocyanic Acid. See *Prussic Acid*.

Ferrol (fėr-rōl'), a fortified seaport of Northern Spain, in the province and about 12 miles N. E. of the town of Coruña, on a fine inland bay,

connected with the sea by a channel so narrow as to admit only one ship-of-the-line at a time. The chief naval arsenal of Spain, established on a magnificent scale, is here. The manufactures consist chiefly of swords, cutlery, and military and naval equipments. Pop. 25,281.

Ferry (fér'i), a particular part of a river, lake, arm of the sea, etc., where a boat or other conveyance plies to carry passengers or goods from the one side to the other. The right of establishing a public ferry is usually the prerogative of a government or legislature. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. No one will be allowed to establish a rival ferry so near the original one as to destroy its custom. Common rowing-boats, sailing-boats, large flat-bottomed barges pulled along a rope stretched from bank to bank for horses and carriages, and steam ferry-boats are among the conveyances.



Ferry (fā-rē), Jules François Camille, a French statesman and writer, born at St. Dié in the Vosges in 1832. He became a barrister at Paris, but devoted himself almost entirely to journalism. His articles in the *Presse*, *Courrier de Paris*, and *Temps*, from 1856 to 1869, brought him much into notice, and in 1869 he was returned as deputy for the sixth arrondissement of Paris and took his seat among the members of the 'Left.' After the fall of Sedan he became a member of the Government of the National Defense. In 1872 Thiers appointed him minister-resident at Athens. In 1879 he became minister of public instruction, and as such introduced an education bill, which amongst other things forbade unauthorised communities, such as Jesuits, to teach in schools. In 1880, Ferry, having become premier, entered upon a vigorous and somewhat hazardous foreign policy. His seizure of Tunis in 1881 was in itself successful, though it led to his resignation; again premier in 1883 his unfortunate expedition to Tonquin forced him to retire from office. On Feb. 24, 1893, he was elected president of the senate, but died March 17 of the same year.

Ferry, Thomas White, Senator, was born at Mackinaw, Michigan, in 1827; died in 1896. He was elected to the Michigan legislature in 1850, served in the House of Representatives at Washington 1864-71, and in the Senate 1871-83. As president *pro tem.* of the Senate, he became acting Vice-President of the United States on the death of Vice-President Wilson in 1875.

Ferté-sous-Jouarre (fer-tā-sözhö-ar), a town of France, department of Seine-et-Marne, 37 miles E. N. E. of Paris. Pop. 4804.

Fertilization of Plants.

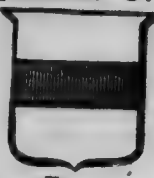
See *Botany.*

Fertilizers (fer-til-i'zerz), the name given to various kinds of manures for enriching soils, (which see).

Ferula (fer'u-la), a genus of umbelliferous plants, whose species often yield a powerful stimulating gum resin, employed in medicine. The species are natives of the shores of the Mediterranean and Persia, and are characterized by tall-growing, pithy stems, and deeply-divided leaves, the segments of which are frequently linear. *F. communis* of English gardens is called giant fennel. *F. orientalis* and *F. tingitana* are said to yield African ammoniacum, a gum resin like asafetida, but less powerful. *Ferula fœtida* (or *F. persica*) produces asafœtida.

Fescennine Verses (fes'sen-in), rude Latin verses in the form of a dialogue between two persons, who satirized and ridiculed each other's failings and vices with great freedom of speech. They originated in country districts in ancient Italy, but were ultimately introduced into the towns, and formed a favorite amusement at marriages and on other occasions of festivity.

Fescue (fes'kū), the popular name of a genus of grasses (*Festuca*) belong to the division with many-flowered spikelets on long stalks. *F. pratensis*, or meadow fescue, and *F. duriuscula*, or hard fescue, are both highly prized for agricultural purposes. *F. ovina*, or sheep's fescue, is much smaller than either of these, and is useful for lawns. It is abundant in mountain pastures. *F. elatior*, the tall fescue, is a coarse reedy grass with stem usually 4 or 5 feet high. All these species are perennial.


Fesse.

Fesse (fes), in heraldry, a band or girdle comprising the central third part of the shield, and formed by two horizontal lines drawn across it; it is one of the nine honorable ordinaries. The fesse-point is the exact center of the escutcheon.

Fessenden, William Pitt, an American statesman and financier, born at Boscawen, N. H., in 1806; died in 1869. His anti-slavery views secured his election to the Senate in 1854, and his speeches brought him fame. When the war broke out he became head of the Finance Committee, and in 1864 became secretary of the treasury. He returned to the Senate in 1865, becoming the recognized leader of the Republican party, but brought on himself undeserved unpopularity by opposing the impeachment of President Johnson (1868).

Festiniog (fes-tin'i-og), a town of N. Wales in Merioneth, with important slate quarries. Pop. 9682.

Festivals (fes'ti-valz), or Feasts, certain days or longer periods consecrated to particular celebrations either in honor of some god, or in commemoration of some important event. Such festivals have prevailed among nearly all nations, both ancient and modern. Among the Jews there are six festivals prescribed in the Scriptures (Lev., xxiii), and thence called sacred feasts. These are the weekly feast of the Sabbath; the Passover, or Feast of Unleavened Bread; Pentecost, or the Feast of Weeks; the Feast of Trumpets, or New Moon; the Feast of the Atonement; and the Feast of Tabernacles. Afterwards the Feast of Purim (to commemorate the failure of Haman's machinations) and the Dedication of the Temple (after its profanation by Antiochus Epiphanes) were added. Among the ancient Greeks were celebrated the Dionysia; the Eleusiania; the four great national games, the Olympic, the Isthmian, Nemean, and Pythian games. But each community and city had its own local festivals in addition, such as the Panathenæa, held by the tribes of Attica, whose union it was intended to celebrate. Among Roman festivals were the Saturnalia, Cerealia, Lupercalia, and others.

The festivals of the Christian Church owe their origin partly to those of the Jewish religion, such as Easter, which corresponds to the Passover of the Jews, and Whitsuntide, which corresponds to Pentecost; partly also to pagan festivals, which the Christian hierarchy, finding it impossible to abolish them, applied to Christian uses by converting them into festivals of the church. These festivals are divided into movable and immovable; the former those which in different years fall on different days, the latter those which always fall upon the same day. The chief of the movable feasts is Easter, the one on which the position of all the others, except that of Advent Sunday, depends. (See *Easter.*) Septuagesima Sunday falls nine weeks before Easter, Sexagesima Sunday eight weeks, Quinquagesima Sunday seven weeks, the first Sunday in Lent six weeks, and Palm Sunday one week before Easter. Rogation Sunday falls five weeks, Ascension Day forty days, Whitsunday seven weeks, and Trinity Sunday eight weeks after Easter. Ash Wednesday is the Wednesday before the first Sunday in Lent, Maundy Thursday the Thursday, and Good Friday the Friday before Easter, and Corpus Christi is the Thursday after Trinity Sunday. Advent Sunday is the nearest Sunday to the feast of St. Andrew, November 30, whether before or after. The chief immovable feasts are the feast of the Circumcision on the 1st of January, Epiphany on the 6th of January, the Annunciation of the Blessed Virgin on the 25th of March, the Transfiguration of Christ on the 6th of August; the feast of St. Michael (Michaelmas) and All the Angels on the 29th of September, the feast of All Saints on the 1st of November, the festival of All Souls on the 2d of November, and Christmas Day, or the Feast of the Nativity of our Lord, on the 25th of December. The festivals relating to the Virgin Mary in the Roman Catholic Church include: the feast of the Annunciation; the Purification of the Virgin, or Candlemas; the feast of the Visitation of Our Lady; the feast of the Immaculate Conception; the Nativity of the Virgin; the Martyrdom of the Virgin Mary; the Assumption of the Virgin (Aug. 15); and several smaller ones. The worship of the cross introduced two festivals: that of the Invention of the Holy Cross (May 3), and that of

the Exaltation of the Cross (September 14). The saints' days that are still held as festivals, and have religious services connected with them in the Church of England, are called *red-letter* days, because they used to be printed with red letters in the church calendar; while the saints' days which were still retained in the calendar at the Reformation, but had no services connected with them, are called *black-letter* days, because they were printed in black letters.

Festoon (fes-tōn'), in architecture, same as *Encarpus*.

Festus (fes'tus), Porcius, a Roman procurator of Judea 61-62 A.D., successor of Felix. The Apostle Paul appeared before him, and was sent by him to Rome at his own request.

Festus, Sextus Pompeius, a Roman grammarian belonging to the second or third century of our era, author of an abridgment of a work by Verrius Flaccus called *De Verborum Significatione*, a kind of dictionary, which is very valuable for the information it contains about the Latin language. The work of Festus was still further abridged in the eighth century by Paulus Diaconus. The one MS. of the original work of Festus is now at Naples.

Fétis (fā-tēs), François Joseph, a Belgian musical composer and writer on music, born 1784; died 1871. He was educated at the Paris Conservatoire; was professor there from 1818 to 1833, when he was appointed director of the Conservatoire at Brussels. Among his works may be mentioned *Traité de la Fugue* (1825); *Biographie Universelle des Musiciens* (1835-44); and *Traité Complet de la Théorie et de la Pratique de l'Harmonie*. His musical compositions include operas, sacred music, and instrumental pieces for the piano and the violin.

Fetish, or Fetich (fē'tish), a word first brought into use by De Brosses, in his work *Du Culte des Dieux Fétiches* (1760), and derived from the Portuguese *feitiço*, magic, a word which expressed the Portuguese opinion of the religion of the natives of the west coast of Africa. The Portuguese gave this name to the idols of the negroes of Senegal, and afterwards the word received a more extensive meaning. A fetish is any object which is regarded with a feeling of awe, as having mysterious powers residing in it, but without any consciousness in the exercise of them. The fetish may be animate, as a cock, a serpent, etc.; or inanimate, as a river, a tooth, a shell. Fetish worship prevails in Guinea and other parts of the west coast of Africa. In addition to the common fetish of the tribe every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

Fetus, Fœtus (fē'tus), the young of viviparous animals in the womb, and of oviparous animals in the egg, after it is perfectly formed; before which time it is called *embryo*.

Feu (fū), Feu-holding, in Scottish law, in its widest sense signifies any tenure of land which constitutes a relation of superior and vassal. The term is now, however, restricted to a special kind of tenure by which usually a small piece of ground is held perpetually from a superior on payment of an annual sum.

Feudal System (fū'dal), that system by which land (a *fief*) is held by a vassal on condition of fidelity—that is, in consideration of services to be rendered to his superior or feudal lord. The nature of the feudal system is to be explained by its origin among the Germanic tribes. In the earliest times the relation of superior and vassal did not exist in connection with the ownership of land. Each freeman had his share of the tribe lands, which were held simply on condition of his fulfilling his public duties of attendance at the councils of the mark or township and performing his share of military service in the wars or musters decreed at such councils. The noble had, of course, more land and more influence than the simple freeman, but there need be no tie of vassalage between them. This seems to have been the primitive social organization of the Anglo-Saxons and other German tribes. The lands held by all freemen, whether noble or ordinary freemen, under this system, are said to be *allodial*, as distinguished from *feudal* lands, which imply service to a superior lord. By the close of the tenth century, however, this system had undergone considerable modifications. The masses of Teutonic invaders who overran Gaul and England had necessarily to confer exceptional powers on their leaders; and as they were for long very much in the position of military in an enemy's country, these powers were naturally continued. Thus it was that kings, before unknown to the Anglo-Saxons, make their appearance immediately after their descent upon Britain. It was common for a chief or great man to have a retinue or bodyguard composed of valiant youths, who were furnished by the chief with arms and provisions, and who in return devoted themselves to his service. These com-

panions (Anglo-Saxon, *Gesithes;* German, *Gesellen*) originally received no pay except their arms, horses, and provisions, and the portion of the spoils which remained after the chieftain had taken his own share. But when conquered lands came to be apportioned and large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy for life. These estates were called *beneficia* or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants on the same terms. As the son commonly esteemed it his duty, or was forced by necessity, to devote his arm to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right and the fief became hereditary. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. Thus a feudal nobility and a feudal system arose and for a time existed alongside of the old allodial system. But gradually the greater security to be got by putting oneself under the protection of some powerful ruler or leader gave the feudal system the predominance. The free proprietor of landed property, oppressed by powerful neighbors, sought refuge in submitting to some more powerful nobleman, to whom he surrendered his land, receiving it back as a vassal. Even the inferior nobility found it to be to their advantage to have themselves recognized as feudatories of the nearest duke or earl; and as the royal power steadily advanced, the offices of duke, ealdorman, gerefa, etc., were always bestowed by the king. Thus the crown became the source of all authority and possession in the country. The land which had once been 'folcland,' or the land of the people, became the land of the king, from whom all titles to it were held to be derived. Such at least was the development of feudalism in England, where its centralizing tendencies, especially in the matter of holding land from the crown, were strongly reinforced by the circumstances of the conquest under William the Norman. Under him and his immediate successors there was a struggle between royalty and the nobility, which ended in the power of the latter sinking before that of the kings. On the other hand, in Germany, France, and elsewhere on the continent, the disintegrating tendencies of feudalism as a system of government had full play. In these countries the weakening of the kingly authority encouraged the great feudal dukes and counts to set up in an almost absolute independence, which in France was afterwards gradually lost as the monarchy grew stronger, but in Germany continued to divide the land down almost to our own times into a number of petty principalities.

Among the chief agencies that overthrew the feudal system were the rise of cities, the change in modes of warfare, and the spread of knowledge and civilization. The spirit of the feudal system, grounded on the prevalence of landed property, was necessarily foreign to cities which owed their origin to industry and personal property, and founded thereon a new sort of power. The growth of this new class, with its wealth and industrial importance, has contributed more than anything else to a social and political development before which the old feudal relations of society have almost totally disappeared. Even yet, however, the laws relating to land still bear the stamp of feudalism in various countries. In England, for instance, all landowners are theoretically regarded as tenants holding from some superior or lord, though the lord may be quite unknown. See also *Middle Ages.*

Feuerbach (foi'ĕr-bȧȧ), LUDWIG ANDREAS, a German metaphysician, son of the celebrated jurist (see next article), was born at Landshut in Bavaria in 1804. After studying theology and philosophy at Heidelberg and Berlin he became a tutor (privatdocent) at Erlangen University in 1828. As his negative views in theology were obnoxious to government, and thus deprived him of all chance of a professorship, he resigned, and the latter part of his life was passed in straitened circumstances. He died in 1872. All transcendental ideas, such as God, immortality, etc., Feuerbach came to regard as deleterious illusions, and considered that the direct contact of the senses with things alone gave the full truth. His works include a *Critique of Hegel* (1839); *The Essence of Christianity* (1841), translated by George Eliot (1854); *The Essence of Religion* (1849), and *Godhead, Freedom, and Immortality* (1866).

Feuerbach, PAUL JOHANN ANSELM, a German criminal jurist, was born at Jena in 1775. Having published his first work, entitled *Anti-Hobbes,* in 1798, he began in 1799 to deliver lectures on law at Jena as privatdocent. In 1801 he became an ordinary professor of jurisprudence at

Jena, but the following year accepted a chair at Kiel. In 1804 he obtained an appointment in the University of Landshut, where he was employed to draw up the plan of a criminal code for Bavaria, which received the royal assent in 1813. In 1814 he was appointed second president of the appeal court at Bamberg, and in 1817 first president of the appeal court for the circle of Rezat at Anspach. He died in 1833. Among his most interesting and important works are *Remarkable Criminal Trials*, and *Themis, or Contributions to the Art of Lawmaking*.

Feuillants (*feu-yän*), a religious order which arose as a reform of the order of Bernardins, and took origin in the abbey of Feuillants, near Toulouse, established in 1577. There were also convents of nuns who followed the same reform, called *Feuillantines*. They were suppressed by the revolution of 1789, and their convent in Paris taken possession of by a political club named the Feuillants, of which Mirabeau was a member.

Feuillet (*feu-yā*), Octave, a French novelist and dramatist, born at Saint Lô, department of Manche, in 1812, came into notice about 1846 with his novels of *Le Fruit Défendu*, *Le Conte de Polichinelle*, and a series of comedies and tales which were published in the *Revue des deux Mondes*. In 1857 the appearance of *Le Roman d'un Jeune Homme Pauvre* raised Feuillet to the first rank of the novelists of the day. Amongst his other numerous novels are *Monsieur de Camors* (1867), *Julia de Trécœur* (1872), *Le Sphinx* (1874), *Histoire d'une Parisienne* (1881), etc. His works have a refined humor, and are free, in great part, from the realistic coarseness of the later French school. Died 1890.

Feuilleton (*feu-i-ton*), that part of a French newspaper devoted to light literature or criticism, and generally marked off from the rest of the page by a line. The feuilleton very commonly contains a tale.

Fever (*fē'ver*; Latin, *febris*), a diseased condition of the body characterized by an accelerated pulse, with increase of heat, deranged functions, diminished strength, and often with excessive thirst. Fevers usually commence with chills or rigors, known as the *cold stage* of the disease, although the temperature of the body is really increased. There are also a feeling of lassitude, pains in the back and limbs, loss of appetite, and nausea. This soon develops into the *hot stage*, in which the pulse quickens and the skin becomes hot and dry. These phenomena are accompanied by thirst, headache, a furred tongue, a constipated state of the bowels, and a deficiency in the urinary secretion. The symptoms are generally aggravated at night, and may even be accompanied by slight delirium. After a time the *crisis* is reached, when the patient either dies from gradual exhaustion or from hyperpyrexia, or he begins to recover, the febrile symptoms disappearing sometimes quite suddenly, sometimes very slowly. The loss of strength in fever due to the waste of tissue (caused by the abnormal temperature) being greatly in excess of the nutritive supply, together with the general disturbances of functions, often brings about fatal results. In many cases fever is only an accompanying symptom of some specific disorder, but in others it is the primary and predominant element, apparently due to some poison operating in the blood. (See *Germ Theory of Disease*.) These primary or specific fevers may be classified as follows:—

1. *Continued Fever*, in which there is no intermission of the febrile symptoms till the crisis is reached. Simple fever, or febricula, typhus, typhoid (enteric or gastric) fever are examples. *Relapsing fever* also comes under this head; its chief feature is the recurrence of fever about a week after the subsidence of the symptoms.

2. *Intermittent Fever* or *Ague*, in which there is a periodic cessation of the symptoms. The varieties are the *quotidian*, occurring every day; the *tertian*, recurring in 48 hours; *quartan*, recurring in 72 hours or every three days.

3. *Remittent Fever*, in which there is a short daily diminution of the symptoms. The condition known as hectic fever and yellow fever belong to this class.

4. *Eruptive Fevers* — (1) Smallpox. (2) Cowpox. (3) Chicken-pox. (4) Measles. (5) Scarlet fever. (6) Erysipelas. (7) Plague. (8) Dengue fever. See the separate articles.

Feverfew (*fē'ver-fū*; *Pyrethrum Parthenium* or *Matricaria Parthenium*), a common composite biennial, frequent in waste places and near hedges. It has a tapering root, an erect, branching stem about 2 feet high, and stalked compound leaves of a hoary green color, and ovate cut leaflets. The plant possesses tonic and bitter qualities, and was supposed to be a valuable febrifuge, whence its name.

Fez, one of the two capitals of Morocco, 100 miles east of the Atlantic and 85 miles south of the Mediterranean. It is finely situated on the

hilly slopes of a valley, on the river Fez, which divides Old Fez from New Fez. Both parts are surrounded by walls now in very bad repair. The streets are narrow, dark, and extremely dirty; the houses two or three stories high, and without windows to the street. The interiors, however, are often handsome, the courtyards being paved and provided with fountains. There are many mosques, one of them the largest in N. Africa. The sultan's palace is a large but somewhat ruinous structure. Fez is a place of considerable commercial importance, being the depot for the caravan trade from the south and east and having extensive dealings with Europe. The manufactures consist of woolen cloaks, silk handkerchiefs, leather, the red caps named *fezes*, carpets, pottery, etc. Fez was at one time famous as a seat of Arabian learning. It is considered a holy town by the Western Arabs, and was resorted to by them as a place of pilgrimage when the way to Mecca was obstructed. Fez was founded in 793, and was the capital of an independent state from 1202 to 1548, attaining a high state of prosperity. The population is variously estimated from 90,000 to 140,000, with about 10,000 Jews.

Fez (from *Fez*, the above town), a red cap of fine cloth, with a tassel of blue silk or wool at the crown, much worn in Turkey, on the shores of the Levant, in Egypt, and North Africa generally. The core or central part of a turban usually consists of a fez.

Fezzan (fez-zän'), a state of North Africa, in the Sahara, forming a depression surrounded by mountain chains and consisting of a great number of small oases. There are no rivers or brooks, and few natural springs; but water is found in abundance at various depths, generally from 10 to 20 feet. Rain seldom falls; in some districts it does not rain for years together, and but little at a time. Wheat, barley, millet, figs, melons, and other fruits, tobacco, cotton, etc., are cultivated, but the chief wealth of the country is in its date-palms. With the exception of goats and camels, and in some districts sheep and cattle, few domestic animals are reared. There are few manufactures, but there is a considerable caravan trade, especially in slaves, Mourzuk, the capital, being the point of junction for caravans from Timbuctoo, Cairo, Tripoli, Soudan, etc. The natives are a mixed race of Arabs, Berbers, negroes, etc. Fezzan is governed by a lieutenant-governor (Kaimakam) sent from, and dependent therefore on, Turkey. The population is variously estimated at from 50,000 to 150,000. Area, 120,000 square miles.

Fiacre (fē-ä-kr), in France, a small four-wheeled carriage or hackney-coach, so called from the Hotel St. *Fiacre*, where Sauvage, the inventor of these carriages, established in 1640 an office for the hire of them.

Fiat (fī'at); (Lat., 'let it be done'), in English law, a short order or warrant from a judge for making out and allowing certain processes.

Fiat Money, any currency, paper or metal, placed in circulation and maintained as legal tender by the command (fiat) of a government or other competent power. The term is usually applied to a paper currency, the substance of which is valueless, but which has been made legal tender by them, as distinguished from metal coins supposedly equal to their face value.

Fibers used in Manufacture.

These may be of mineral, animal, or vegetable origin. In the mineral kingdom a fiber which may be so used has been found in asbestos (which see). Amongst animal fibers the silk obtained from the cocoons of the silkworm and the wool of the sheep represent two great classes. (See *Silk* and *Wool*.) Of the latter, the wool of the sheep is by far the most important on account of its length, its fineness, and the comparative ease with which it can be produced in large quantities for the market. Amongst other animals whose wool or hair is also used to some extent are the goat, especially of the Angora species, the llama or alpaca, the vicuña, the rabbit, the yak, the chinchilla, etc. But the vegetable kingdom furnishes by far the greatest number and variety of fibers for manufacturing purposes. These fibers are obtained either, as in exogenous plants, from the sheath of the bark, or bast; or, as in endogenous plants, from the cellular tissues and pulp of their roots, stems, and leaves; or, in a few plants, from a hairy covering which grows upon the seeds within the pod. Of the first class are flax, from the fibers of the *Linum usitatissimum;* hemp, from the *Cannăbis sativa*, a plant of the nettle family; jute, from several species of *Corchŏrus*, a plant of the linden family; China grass from the *Boehmeria nivea*, etc. To the second class belong New Zealand flax, from the leaves of the *Phormium tenax;* Manila hemp, from the leafstalks of the *Musa textilis;* coir of cocoanut fiber, from the husk of the cocoanut; pita-flax, the fiber of the leaves of the *Agāve Americana*, etc. To the third class belong cotton, from the

seed-hairs of *Gossypium;* vegetable silk, the fibers which grow upon the seeds of the [illegible]oladaceæ, etc. For details see *Cotton, Flax, Hemp, Jute, Silk, Wool,* etc.

Fibrin (fī'brin), a peculiar organic compound substance found in animals and vegetables. Animal fibrin constitutes the solid matter which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus and other pathological fluids. Fibrin is composed of carbon, nitrogen, hydrogen, and oxygen, and is closely allied to albumen and casein. It is a very important element of nutrition. In healthy venous blood there is about 2.3 present, but its percentage is slightly more in arterial blood. It is best obtained by switching newly-drawn blood with a glass rod or bundle of twigs, when the fibrin adheres to the rod or twigs in threads, and is purified from coloring matter by prolonged washing and kneading with water, and then by treatment with alcohol and ether to remove fat and other substances.

Fibrous Tissue (fī'brus), an animal tissue with a shining, silvery luster used to connect or support other parts. It is of two kinds, white, and yellow (elastic). It forms the ligaments, tendons of muscles, etc.

Fibula (fib'ū-la), in anatomy, the outer and smaller bone of the leg below the knee, much smaller than the tibia. See *Leg.*

Fichte (fih'tē), JOHANN GOTTLIEB, a German philosopher, born of poor parents in 1762; died in 1814. After studying at Jena, Leipzig, and Wittenberg he passed several years as a private tutor in Switzerland and in Prussia proper, and in Königsberg made the acquaintance of the great Kant, who showed some appreciation of his talents. His *Versuch einer Kritik aller Offenbarung* ('Essay Towards a Criticism of All Revelation,' 1792) attracted general attention, and procured him the professorship of philosophy in Jena in 1793. In 1800 he was one of the most prominent professors of that university during its most brilliant period. Here he published, under the name of *Wissenschaftslehre* ('Theory of Science'), a philosophical system, which, though founded on Kant's system, gives the latter a highly idealistic development which was strongly repudiated by the Königsberg philosopher. On account of an article he had written to the *Philosophical Journal* (on the grounds of our belief in the divine government of the world) he fell under the suspicion of atheistical views. This gave rise to an inquiry, which ended in Fichte losing his chair. He then went to Prussia, where he was appointed in 1805 professor of philosophy at Erlangen. During the war between Prussia and France he went to Königsberg, where he delivered lectures for a short time, returned to Berlin after the Peace of Tilsit, and in 1810, on the establishment of the university in that city, was appointed rector and professor of philosophy. Fichte's philosophy, though there are two distinct periods to be distinguished in it, is a consistent idealism, representing all that the individual perceives as distinct from himself, the *ego,* as a creation of this *I* or *ego.* This *ego,* however, is not the consciousness of the individual so much as the divine or universal consciousness of which the other is but a part. His philosophy thus came to assume a strongly moral and religious character. Amongst his best-known works, besides those already mentioned are: *System der Sittenlehre* ('Systematic Ethics'), *Die Bestimmung des Menschen* ('The Destination of Man'), *Das Wesen des Gelehrten* ('The Nature of the Scholar'), *Grundzüge des Gegenwärtigen Zeitalters* ('Characteristics of the Present Age'), *Reden an die Deutsche Nation* ('Addresses to the German Nation').

Fichtelgebirge (fih'tel-ga-bēr'ga), a mountain range of Germany, in Bavaria; chief summit Schneeberg, 3460 feet.

Ficino (fē-chē'nō), MARSILIO, an Italian philosopher of the Platonic school, born at Florence in 1433. His early display of talent attracted the notice of Cosmo de' Medici, who caused him to be instructed in the ancient languages and philosophy, and employed him to aid in establishing a Platonic Academy at Florence (about 1460). Ficino amply satisfied his patron, and many excellent scholars were formed under his tuition. His exposition of Plato's philosophy suffers from his confounding the doctrines of Plato and those of neoplatonism. He died in 1499.

Fiction (fik'shun). See *Novel* and *Romance.*

Fiction, in law, is an assumption made for the purposes of justice, though the same fact could not be proved, and may be literally untrue. Thus an heir is held to be the same person as the ancestor to the effect of making the heir liable for the debts of the ancestor. The rules by which the existence of legal fictions are limited have been stated as follows: (1) The fiction must have the semblance of truth. (2) It shall not be used to work a wrong.

(3) It shall only be employed for the end for which it was introduced.

Fiddlewood, the common name of *Citharoxylon*, a genus of trees or shrubs with some twenty species, natives of tropical America, nat. order Verbenaceæ. Some of the species are ornamental timber trees; several yield a hard wood valuable for carpenter work.

Field (fēld), in heraldry, the whole surface of the shield on which the charges are depicted, or of each separate coat when the shield contains quarterings.

Field, CYRUS WEST, a telegraphic promotor, born at Stockwell, Mass., in 1819; died in 1892. Having become wealthy by trade in New York, he became interested in the idea of ocean telegraphy, and obtaining a charter giving him exclusive right for fifty years of landing ocean telegraphs on the coast of Newfoundland, he organized an Atlantic telegraph company. Attempts to lay cables were made in 1857 and 1858, but without permanent success, and the Civil war having broken out, it was not till 1866 that a cable was successfully laid by the Great Eastern. Mr. Field took an active part in establishing telegraphic communication with the West Indies, South America, etc.

Field, DAVID DUDLEY, lawyer, brother of Cyrus W., was born in Haddam, Connecticut, in 1805; died in 1894. He became especially prominent in the cause of law reform, and in 1857 was appointed president of a commission to digest the political, civil, and penal codes of New York.

Field, EUGENE, poet and journalist, born at St. Louis, Missouri, in 1850; died in 1895. He became connected with the Chicago *Daily News*, and acquired a reputation as a humorist. His poems of child life, including *A Little Book of Western Verse*, *With Trumpet and Drum*, *Second Book of Verse*, *Love Songs of Childhood*, etc., are quaint and beautiful and highly popular.

Field, MARSHALL, an American merchant, born at Conway, Mass., in 1835; died in 1906. He removed to Chicago in 1856, and in 1865 organized the firm which later became Marshall Field & Co., one of the largest mercantile houses in the world. His fortune was estimated at $150,000,000. He founded the Field Museum of Natural History (which see), and gave valuable real estate to the University of Chicago.

Field, STEPHEN J., jurist, born in 1816, at Haddam, Connecticut; was graduated 1837; studied law with his brother, David D. In 1849 he went to California and settled at Marysville. There he held various local offices; was sent to the Legislature in 1850; made judge of the State Supreme Court in 1857, and its chief justice in 1859. In 1863 President Lincoln appointed him Associate Justice of the United States Supreme Court, in which office he rendered many important decisions. An attempt was made to assassinate him in 1889 by Judge Terry, a disappointed litigant. He resigned in 1897 and died two years later.

Field Artillery, light ordnance, easy of draught, and hence fitted for rapid movements in the field.

Field Cricket, *Achēta* (*Gryllus*) *campestris*, one of the most noisy of all the crickets, larger but rarer than the house cricket. It frequents hot, sandy districts, in which it burrows to the depth of 6 to 12 inches, and sits at the mouth of the hole watching for prey, which consists of insects.

Field Fortification, FIELDWORKS, temporary works, such as trenches, rifle-pits, etc., thrown up to strengthen the position of an army in the field. See *Fortification*.

Field-glass, a binocular telescope in compact form, usually from 4 to 6 inches long. The name is also given to a small achromatic telescope usually from 20 to 24 inches long, and having from three to six joints.

Fielding (fēld'ing), ANTHONY VANDYKE COPLEY, an English painter in water-colors, born about 1787. He early attracted attention by his water-color landscapes, and for fourteen years before his death was president of the Society of Painters in Water-colors. His pictures are chiefly taken from English scenery, the various features of which, both in rich woodland and open plain, he has represented with great delicacy and truth, although latterly falling into mannerism and self-repetition. His oil-painting was not a success. He died in 1855.

Fielding, HENRY, one of the greatest of English novelists, was born at Sharpham Park, in Somersetshire in 1707. He was educated at Eton, whence he removed to Leyden; but the straitened circumstances of his father shortened his academical studies, and the same cause, added to a dissipated disposition, turned his attention to the stage. His first dramatic piece was entitled *Love in Several Masks* and was produced at Drury Lane in 1728, meeting with a favorable reception. *The Temple Beau*, *The Author's Farce*, *The Modern Husband*, *Don Quixote in England*, and many others quickly followed, a number of them being little more than free translations

from the French. He himself became a stage manager, and for some time conducted the Haymarket Theater. About 1736 or 1737 he married Miss Craddock, a lady of some fortune, and at the same time, by the death of his mother, became possessed of a small estate in Dorsetshire. He immediately commenced the life of a country gentleman on a scale which, in three years, reduced him to greater indigence than ever, with a young family to support. He then, for the first time, dedicated himself to the bar as a profession, and for immediate subsistence employed his pen on various miscellaneous subjects. *The Champion*, a periodical paper on the model of the *Spectator*, but written in a freer style, and *An Essay on the Knowledge and Characters of Men*, were among the early fruits of his literary industry. In 1740 he was called to the bar, and went on circuit, but with so little success that he was compelled to return to literature. In 1742 the first of his great novels, *Joseph Andrews*, appeared, which he had at first conceived as a burlesque of Richardson's *Pamela*. It was a great success, and was followed by *A Journey from this World to the Next*, and *The History of Jonathan Wild*. In 1749 he was appointed a Middlesex justice, a not very reputable office, but which Fielding's honesty and earnest discharge of his duties did something to render more respectable. In the same year his masterpiece, *The History of Tom Jones*, appeared, and was followed two years afterwards by *Amelia*. At length, however, his constitution, exhausted both by hard work and reckless living, gave way, and in the June of 1754 he had to seek the milder climate of Lisbon, where he died 8th October of the same year. The chief merits of Fielding as a novelist are wit, humor, correct delineation of character, and knowledge of the human heart. He drew from a very varied experience of life, which he reproduced with an artistic realism entitling him to be considered, far more than Richardson, as the creator of the English novel.

Field-marshal, the highest military dignitary in Britain, Germany, and other countries. In Britain the dignity is conferred by selection and enjoyed by but very few officers, and chiefly for distinguished services or on the ground of royal descent. It was introduced into Britain by George II, in 1736.

Field Mouse. See *Mouse*.

Field Museum, an art museum established in Chicago by Marshall Field, a wealthy merchant of that city (1835-1906). It occupies the Fine Art Building of the Chicago Exposition of 1893, and was endowed with $1,000,000 by Mr. Field. In his will he left $8,000,000 more to it.

Field Officers, in the army, those competent to command whole battalions—majors, lieutenant-colonels, colonels, as distinguished from those entrusted with company duties, as captains and lieutenants.

Field of the Cloth of Gold, a spot in the valley of Andren, between the English castle of Guisnes and the French castle of Ardres, celebrated for the meeting (7th June, 1520), between Henry VIII of England and Francis I of France, attended by the flower of nobility of both nations. The diplomatic results were little or nothing, and the event is now memorable only as a grand historical parade.

Fieschi (fē-es'kē), JOSEPH MARIE, conspirator, born at Murato, in Corsica in 1790. He served for some years in the French army, and in the Neapolitan army of Murat. Having returned to his native land, he was convicted of robbery and sentenced to ten years' imprisonment. After the revolution of 1830 he appeared in Paris and by means of forged papers obtained a small pension and an appointment under the pretense that he had been a victim of the Restoration. Being afterwards deprived of his appointment he resolved to avenge the slight by assassinating Louis Philippe, which he attempted by an infernal machine on 28th July, 1835. The king escaped with a slight scratch, although a number of persons around him were killed. Fieschi was guillotined Feb. 19, 1836, along with two of his accomplices.

Fiesole (fē-es'o-lā; anciently *Fæsulæ*), a small town of Italy, 3 miles northeast of Florence, on the top of a steep hill. It has a cathedral and is the seat of a bishop. Anciently it was an important Etruscan city, and still has some Etruscan remains. Pop. 4951.

Fiesole, FRA GIOVANNI DA. See *Angelico*.

Fife (fif), a small instrument of the flute kind, pierced with six finger-holes, and usually having one key. Its ordinary compass is two octaves from D on the fourth line of the treble staff upwards. A combination of fifes and drums is the officially recognised music in the British and American army and navy.

Fife, or FIFESHIRE, a maritime county of Scotland, forming the peninsula between the Firths of Forth and Tay; area 504 sq. miles. The surface

is undulating, the highest elevation being 1720 feet. The principal valley, called Strath Eden, or the 'Howe (hollow) of Fife,' watered by the Eden, is very fertile, highly cultivated, and thickly studded with beautiful mansions and villas. Very fertile also is the district lying along the shores of the Firth of Forth, and remarkable for the number of towns and villages with which it is lined. The northern sections are generally infertile. Fife is the third largest coal-producing county in Scotland. Iron, limestone, and freestone abound. The chief manufacture of the county is linen, damasks, diapers, checks, ticks, etc.; the first two principally at Dunfermline, the last two at Kirkcaldy. There are salmon and other fisheries. The principal towns are Dunfermline, Kirkcaldy, St. Andrews, and Cupar, the county town. Pop. 218,843.

Fifth, in music, an interval consisting of three tones and a semitone. Except the octave, it is the most perfect of concords. Its ratio is 3:2. It is called the fifth, as it comes, by diatonic ascent, in the fifth place from the fundamental or tonic. See *Music.*

Fifth Monarchy Men, a sect of political-religious enthusiasts who during the protectorate of Cromwell assumed to be 'subjects only of King Jesus.' They considered the revolution as the introduction to the *fifth* great monarchy which was to succeed to the four great kingdoms of Antichrist mentioned by Daniel (the Assyrian, the Persian, the Grecian, and the Roman), and during which Christ was to reign on earth 1000 years.

Fig (*Ficus Carica*), a deciduous tree belonging to the order Moraceæ

Fig (*Ficus Carica*).—a, Fruit shown in section.

(mulberry). It is indigenous to Asia Minor, but has been naturalized in all the countries round the Mediterranean. It grows from 15 to 20 or even 30 feet high. In congenial climates it bears two crops in a season, one in the early summer from the buds of the last year; the other (which is the chief harvest) in the autumn, from those on the spring growth. The fruit is a hollow receptacle produced in the axils of the leaves on small round peduncles, and containing a great multitude of minute flowers, the ripe carpels of which are embedded in the pulp. The flowers are male and female, the former situated near the orifice at the top, the latter in that part of the concavity next the stalk. Figs, particularly dried figs, form an important article of food in the countries of the Levant, and are exported in large quantities to America and Europe. The best come from Turkey.

Figaro (fig'a-rō), a dramatic character first introduced on the French stage by Beaumarchais in his comedies, the *Barber of Seville* and the *Marriage of Figaro.* Figaro is a barber remarkable for his shrewdness and dexterity in intrigue. The plays were adapted for Mozart's *Marriage of Figaro* and Rossini's *Barber of Seville.* The name is also well known as that of satirical journals published in Paris and London.

Figeac (fē-zhāk), a town of France, department Lot, 42 miles E.N. E. of Cahors. It is an ancient place, and consists chiefly of narrow, crooked streets and antiquated houses with quaint Gothic fronts. Pop. 4480.

Fighting-fish (*Macropŏdus* or *Ctenops pugnax*), a small fish of the family Anabasidæ (climbing perch), a native of the southeast of Asia, remarkable for its pugnacious propensities. In Siam these fishes are kept in glass globes, as we keep gold-fish, for the purpose of fighting, and an extravagant amount of gambling takes place about the result of the fights. When the fish is quiet its colors are dull, but when it is irritated it glows with metallic splendor.

Figueras (fi-gā'räs), a town of Spain, in the province of and 21 miles N. N. E. of Gerona, near the French frontier, defended by a fortress reputed the strongest in Spain. Pop. 10,714.

Figueras, Estanislao, a Spanish statesman, born in Barcelona in 1819; died in 1882. A leader in the liberal party of Catalonia, he was elected to the Cortes in 1850, and after the dethronement of Queen Isabella was prominent in organizing the republican

party. After King Amadeo abdicated, in 1873, Figueras was provisional president for about four months, being the only president Spain has ever known. He afterwards retired to private life.

Figuier (fē-gē-ā), Louis, a French writer of popular works on science, born 1819; became professor in the School of Pharmacy, Paris. Among his works are *Histoire du Merveilleux dans les Temps Modernes; L'Alchimie et les Alchimistes; Vies des Savants Illustre depuis l'Antiquité jusqu'au XIX Siècle; Les Grandes Inventions; Le Tableau de la Nature;* etc. Several of his works have been translated into English, including different sections of the one last mentioned. He died in 1894.

Figuline (fig'ū-lin), a name given by mineralogists to potter's-clay.

Figural (fig'ū-ral; or Figurate) Numbers, numbers formed by the terms of arithmetical series of all sorts, in which the first number is always unity. For example:

I.—1, 2, 3, 4, 5, 6, etc.
II.—1, 3, 6, 10, 15, 21, etc.
III.—1, 4, 9, 16, 25, 36, etc.
IV.—1, 5, 12, 22, 35, 51, etc.

Those in the second row are called *triangular* numbers, because their units may be arranged in equilateral triangles; the members of the third row are called *square* numbers; those of the fourth *pentagonal*, etc.; and so there are also *hexagonal*, *heptagonal*, and, in general, *polygonal* numbers.

Figurehead, the ornamental figure or bust on the projecting part of a ship's stem, over the cutwater and immediately under the bowsprit.

Figworts, the common name of the *Scrophularia*, and sometimes also applied to the Scrophulariaceæ, a large natural order of exogenous plants represented by the calceolaria, foxglove, veronica, etc.

Fiji (fē'jē), Feejee, or Viti Islands, an island group, South Pacific Ocean, east of the New Hebrides, between lat. 15° 30′ and 19° 30′ S.; and lon. 177° E. and 178° W. The entire group which was discovered by Tasman in 1643, comprises altogether 254 islands and islets, eighty of which are inhabited; total area about 8000 sq. miles. Two of the islands only are of large size, namely, Viti Levu, 90 miles long by 60 wide; and Vanua Levu, rather longer, but much narrower and more irregular. Next to these come Taviuni and Kandavu. The islands are of volcanic origin, extremely fertile, and covered with a luxuriant foliage, especially on the east side. The peaks are usually basaltic cones or needles, some of which rise to the height of several thousand feet. The coasts are almost surrounded with coral reefs, and where the shore is not precipitous the beach is formed of fine coral sand. The cocoanut palm grows along the sea coasts; the breadfruit, banana, and pandanus are abundant; the orange, taro yams, sweet potato, and since the commencement of European settlements, maize, tobacco, and the sugar cane are cultivated; timber trees, including the chestnut are plentiful; sandalwood is now scarce. The birds are wild ducks, pigeons, and domestic fowl, parrots and other tropical species. Except the stock introduced there are hardly any animals. Fish are plentiful. The natives enclose and cultivate their lands, the women performing most of the manual labor. The climate on the whole is healthy and agreeable for Europeans. The Fijians are a dark-colored, frizzly-haired, bearded race of Melanesian extraction, although intermixed with the Polynesians of Tonga and Samoa. They are cleanly in their habits, and are generally regarded as superior to the Polynesians in intelligence. Their early character, however, was bad. Cannibalism was reduced to a system, and wives, children, and friends were often sacrificed to the fondness for human flesh. Cannibalism seems now to be abolished. This result has been due to the Christian missions, mostly Wesleyan, which have been very successful, most of the native population having become professed Christians. From 1866 onwards the influx of European settlers from New Zealand and the Australian colonies gradually brought the trade of Fiji into importance, and repeated applications were made to the British government, both by the settlers and the king, Thakombau, to annex the islands. At length, in 1874, this was done, and the Fiji Islands were made a crown colony, under a governor, assisted by an executive council and legislative assembly, both either officials or nominated by the governor. Native chiefs take part in the administration, the old customary law being still largely adhered to. Since the annexation the prosperity of the colony has been remarkable. The chief article of export is sugar; the next is copra, the dried kernels of the cocoanut. The other important exports are cotton, molasses, coffee, etc. The demand for labor has led to the introduction of some 6000 coolies from India. In 1911 the population was 189,541. The Europeans number about 2500. The capital is Suva, on the south coast

of Viti Levu. The island of Rotumah, to the north, was annexed to Fiji in 1881.

Filaria, a genus of nematodes or round-worms, which includes some parasites dangerous to man. The guinea-worm (*F. medinensis*), which occurs in parts of Africa, forms cutaneous abscesses on the back and legs. The larva inhabits cyclops, a water flea, and is swallowed with dirty water. It is apparently only the female which is parasitic, and it reaches a length of from 20 to 30 inches. The disease caused by these nematodes is called filariasis.

Filbert (fil'bert), the fruit of a cultivated variety of *Corylus Avellāna* or hazel. See *Hazel*.

File (fil), a bar of cast steel with small, sharp-edged elevations on its surface called teeth, the use of which is to cut into or abrade metals, wood, ivory, horn, etc. Files are of various shapes, as flat, half-round, three-sided, square, or round, and are generally thickest in the middle, while their teeth are of various degrees of fineness and of different forms. A file whose teeth are in parallel ridges only is called *single-cut* or *float-cut*. Such are mostly used for brass and copper. When there are two series of ridges crossing each other the file is *double-cut*, which is the file best suited for iron and steel. *Rasps* are files which have isolated sharp teeth separated by comparatively wide spaces, and are chiefly used for soft materials such as wood and horn. Each of these three classes of files is made in six different degrees of fineness, the coarsest being called *rough*, the next *middle*, followed by *bastard*, *second-cut*, *smooth*, and *superfine* or *deadsmooth*, each a degree finer than that which precedes it. Formerly all files were made by hand, the steel bar or *blank* after being forged and ground smooth was laid on the anvil and the teeth struck up with a chisel. Now, however, all the essential operations are performed by machinery. The first commercially practical machine for cutting files was invented by W. T. Nicholson, of Providence, R. I. This machine with improvements and modifications is widely used at present. A new and ingenious file has recently been developed in which semi-circular teeth are cut in the face of the blank. Files of this type are self-cleaning and not apt to clog up in filing soft metals like lead and brass.

File, a row of soldiers ranged one behind another from front to rear. When a column is arranged two deep, a file is thus two men.

File-fish, a name given to certain fishes from their skins being granulated like a file; they constitute the genus *Balistes*. *B. capriscus*, a common inhabitant of the Mediterranean, has the power of inflating the sides of the abdomen at pleasure, and grows to the size of 2 feet. *B. aculeatus* is a native of the Indian and American seas.

Filibuster (fil'i-bus-ter), a name given to those adventurers, chiefly from the United States, who endeavored to effect settlements on the Spanish islands and colonies in Central America. The term is of Spanish origin, but is ultimately from the English *flyboat*, referring to the small fast-sailing vessels used by the buccaneers in the 17th century. Among the most noted of the filibusters was William Walker, who made three expeditions to Nicaragua (1855, 1857, 1860). Also applied to partisans in a legislative assembly who impede legislation by dilatory tactics.

Filicaja (fe-le-kä'yä), VINCENZO DA, an Italian poet, born in 1642 at Florence of a noble family. The publication of his odes, sonnets, etc., in 1684 established Filicaja's fame as the first poet of his time in Italy. The Grand-duke of Tuscany appointed him governor of Volterra, and then of Pisa, in which posts he gained the esteem equally of people and sovereign. He died in 1707. Among his most successful poems are the *Canzone* to John Sobieski on the occasion of the relief of Vienna from the Turks, and the celebrated sonnet on Italy, imitated by Byron in the 4th canto of *Childe Harold*, stanzas 42, 43.

Filigree (fil-i-grē'), a kind of ornamental open work in gold or silver, wrought delicately in the manner of little threads or grains, or of both intermixed. The art was practised by the Etruscans and the Greeks of the Byzantine Empire. In the 17th century it was carried to great perfection in Italy, and silver filigree work is still largely manufactured in the south of Europe. Some of the eastern nations, especially the Chinese and Malays, show great skill in the manufacture of silver filigree.

Filipo d'Argiro, SAN. Same as *Agira*.

Fillan (fil'an), ST. Two saints of this name, who flourished in the 7th and 8th centuries, appear in the church calendars.—(1) ST. FILLAN, or FAOLAN, the leper, whose annual festival is the 20th of June. His principal church in Scotland was at the lower end of Loch Earn, in Perthshire, where 'St. Fillan's Well' was long believed to have wonderful healing properties.—(2) ST. FILLAN, the abbot, the son of St. Kentigerna in Inchcailleach, in Loch Lo-

mond, had his chief church also in Perthshire, in Strathfillan, the upper part of Glen Dochart. The silver head of this abbot's crozier, entrusted by King Robert Bruce to the Dewar family, is now in the Antiquarian Museum, Edinburgh.

Fillet (fil'et), in architecture, a small molding, generally rectangular in section, and having the appearance of a narrow band, generally used to separate ornaments and moldings.

Fillmore (fil'mōr), MILLARD, the thirteenth President of the United States, was born in Cayuga Co., New York, in 1800; died in 1874. First a teacher, then a lawyer, he was elected to Congress in 1832, and was re-elected by the Whig party in 1836, 1838 and 1840, and was the chief author of the tariff of 1842. He was a candidate for Governor of New York in 1844, was elected comptroller of that State in 1847, and was elected Vice-President of the United States in 1848, General Taylor being chosen President. On Taylor's death, July 9, 1850, he became President. His term was one of great political irritation, and he gave much offense to the Northern Whigs by signing the bill for the return of fugitive slaves. He was the candidate of the American party for the presidency in 1856, but received no electoral votes but those of Maryland.

Film. A term used in photography for a flexible sheet of celluloid or like material covered with a sensitized coating for the taking of pictures. Films are produced in the form of a rolled ribbon or in cut sheets for plate holders or special containers. They are chiefly used by amateur photographers and for the production of moving pictures.

Filtration (fil-trā'shun), the process of freeing a liquid from solid matter suspended in it by causing it to pass through some previous substance or substances which catch and retain the solid matter. The materials of which a filter is composed must have pores or interstices sufficiently coarse to allow the passage of the liquid, and yet sufficiently fine to prevent the passage of any solid particles. On a small scale unsized paper is generally used; but on a large scale various kinds of stone, sand, gravel, powdered glass, clay, porous sulphur, preparations of iron, charcoal, cloth, felt, horsehair, skins, silicated carbon, sponge, wood, wool, cane, capillary threads, etc., are all employed. In domestic filters the simplest forms are those in which the water passes down by its own gravitation through the filtering medium to a reservoir below. Lateral and ascending filtration are not uncommon. One of the most successful forms of ascending filter is divided into four compartments, as seen in the figure. The uppermost part, containing the water to be filtered, communicates with the lowest by a tube having a loose sponge at its mouth to stop some of the impurities. The top of the lowest compartment is composed of a porous slab, through which the water passes into the third part, which is filled with charcoal. The water is finally forced through the charcoal and another slab into the remaining compartment, which is furnished with a tap to draw off the filtered water. The filters at waterworks are large tanks or beds, made of good clay and filled with layers of large stones, pebbles, and coarse gravel, fine gravel, coarse sand and fine sand—the fine sand being at the top. Other materials are sometimes utilized, such as furnace cinders or clinkers, shells or shell-sand, and so forth. The water in the reservoir, collected from springs, surface drainage, and rain, is allowed to deposit its suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed, and the water then flows into the mains which are to convey it to the locality where it is to be used. Filtration can remove only the substances mechanically suspended in the liquid. In order to remove dissolved substances distillation is necessary. In addition to these mechanical methods of filtration, chemical methods are also in use, foreign substances being removed from the water by chemical processes. The water-supply of many cities is now purified by filtration on a great scale, the last notable example of this being the supply of Philadelphia, where an admirable system of sand filtration has been introduced during the last decade, with excellent results in removing the pernicious bacteria and reducing the prevalence of typhoid and other water-borne diseases.

LESLIE'S WATER FILTER.

1 2 3 4, The compartments; a b, porous top of 2d compartment; c d, filtering top of 3d compartment; e, movable plug.

Finale (fi-nä'lā), the concluding part of a musical composition, for instance, of a quartette, of a symphony,

of any act of an opera, of a ballet, etc. It consists of compositions of various characters.

Finance (fi-nans'), the system or science of public revenue and expenditure. In the plural the term is applied to the income or revenue of a state, to the funds in the public treasury, and also to private income or resources. See in this connection such articles as *Exchequer*, *National Debt*, *Tax*, *Bank*, etc.

Finback, or FINNER, a name given to the species of a genus of whales (*Physălus*), so called from their possessing a dorsal hump or fin. The name is also sometimes given to the members of the genus *Balænoptĕra* or rorquals.

Finch (finsh), one of the Fringillidæ, a large family of small seed-eating birds, inhabiting all parts of the globe, and belonging to the order Insessores, section Conirostres. They are distinguished by having a sharply-pointed, conical, and in most cases a strongly-formed bill, suitable for crushing seeds and other hard objects. The species have been divided among several sub-families, as the hawfinches, the true finches, the buntings, the larks, the bullfinches, etc.

Finch, HENEAGE. See *Nottingham, Earl of.*

Finden (fin'den), WILLIAM, line engraver, born in 1787; died at London in 1852. He engraved many illustrations for the *Annuals* and other books. In conjunction with his younger brother Edward and assistants he produced several extensive series of engravings of great merit; the first and most successful of which was *Illustrations of the Life and Works of Lord Byron*. Other series followed, including the *Royal Gallery of British Art*, 1838-40, a very important publication, the engravings in which measure 13½ x 9½ in., and are of the highest class. The plates are executed by various engravers of the foremost rank. Besides his book-plates, Finden produced some celebrated large engravings, among which may be mentioned *The Village Festival*, after Wilkie, *George IV*, after Sir Thomas Lawrence.

Findlay (find'lā), a city, county seat of Hancock Co., Ohio, 43 miles s. of Toledo, on the Blanchard River. It is in the oil and natural gas region of Ohio and has extensive manufactures of automobile trucks, beet sugar, clay and porcelain ware, machine, boiler, engine and bridge works, etc. Pop. 16,325.

Findhorn (find'hōrn) a Scotch salmon river which flows through the counties of Inverness, Nairn, and Elgin, and falls into the Moray Firth after a course of 62 miles.

Fine (fin), in English law, formerly signified a sum of money paid at the entrance of a tenant into his land and on other occasions, but now has the signification of a pecuniary penalty exacted either in punishment of, or in compensation for, an offense, whether committed against an individual, in contravention of the laws of the community, or against the community itself.

Fine Arts, the arts whose object is the production of pleasure by their immediate impression on the mind, as architecture, poetry, music, painting, and sculpture. In modern usage the term is often restricted to the imitative arts which appeal to us through the eye—namely, painting, sculpture, engraving, architecture, and is sometimes even restricted to the first two as more essentially imitative and imaginative.

Fingal (fin'gal), a hero of Gaelic romance, celebrated as a great warrior and a generous man in many old ballads belonging alike to Ireland and Scotland; but more especially the hero of an epic poem attributed to Fingal's son Ossian, first published by James Macpherson in 1762. See *Ossian*.

Fingal's Cave, a famous natural cavern in the island of Staffa, one of the western Islands of Scotland. It extends 227 feet from its mouth inward, is composed of lofty basaltic columns, beautifully jointed, and of most symmetrical, though somewhat varied forms. The height from the top of the arched roof to the mean level of the sea is 66 feet; the breadth at the entrance 42 feet, at the end of the cave 2 feet.

Finger-print System. Impressions of finger-prints as a means of identification for police purposes are taken in two ways: 'rolled' and 'plain.' To take a 'rolled' impression the bulb of the finger is placed on the inked slab, and the finger turned over until the bulb, which originally faced to the left, faces to the right. It is then pressed lightly and in the same way upon paper. A plain impression is secured by placing the bulb of the finger on the inked slab and then impressing it on the paper without any turning movement. These impressions are placed on sheets marked out for the purpose, and filed. The system has been adopted in the United States, where it is used in the police departments, in the War Office and in the Marine Corps.

Finial (fin'i-al), in architecture, an ornamental bunch of foliage which terminates pinnacles, canopies, pediments, etc., or any ornament of like kind.

By older writers the term is used to denote not only the leafy termination, but the whole pyramidal mass.

Finiguerra (fē-nē-gwĕr'rä), Tommaso, or Maso, a Florentine goldsmith of the 15th century, one of the best workers in *niello*, a form of decorative art then much in vogue in Italy, and the inventor of the method of taking impressions from engraved plates.

Fining (fī'ning), a substance used to clarify liquors, usually such as are out of condition or are of inferior quality. A solution of isinglass is generally used for beer, and alum, carbonate of soda, salt of tartar, etc., for spirits. Finings always destroy some of the real virtue of the liquor.

Finistère (fi-nis-tăr; 'Land's End'), a department of France, so named from occupying its westernmost extremity; area, 2595 square miles. The coast-line is bold and precipitous, composed almost throughout of lofty granite cliffs, in which are numerous deep indentations, the two most important of them forming both the bay of Douarnenez and the roadstead of Brest. The interior is traversed by hills which extend in all directions. The soil is generally fertile and well cultivated; fishing is extensively carried on; and the minerals are of considerable importance, including iron, zinc, bismuth, and lead. The manufactures consist chiefly of sailcloth, linen, soap, oil, candles, ropes, leather, paper, and tobacco. Shipbuilding also is carried on, and the general trade is extensive. Quimper is the capital; other towns are Brest, Châteaulin, and Morlaix. Pop. (1906) 795,103.

Finisterre, Cape, the most western cape of Spain, on the coast of Galicia.

Finland (fin'land), formerly a Russian grand-duchy, containing 134,829 sq. miles, bounded N. by Norway, E. by the governments of Olonetz and Archangel, S. by the Gulf of Finland, W. by Sweden and the Gulf of Bothnia. The capital is Helsingfors. The country, in some parts, is hilly, being traversed by the continuations of the Scandinavian Mountains, and, in others, is sandy, marshy, and abounding in lakes, which furnish one of the most characteristic features of the scenery. The rivers are unimportant for navigation, but yield much motive power and are rich in fish. Tillage and cattle-breeding are carried on to some extent; but the most valuable exports are the products of the forests, timber, pitch, tar, and rosin. More than half of them belong to the state, and the management of this portion is carefully regulated, while the private owners handle their estates wastefully. The fauna of Finland is very rich, all domestic animals thrive, the horses being notable for speed, hardihood, and docility. The climate is severe, but healthy; the mean yearly temperature in the north is 27.5° F., at Helsingfors 38.7°. The principal minerals are iron and copper; granite is extensively quarried. The inhabitants are mostly Finns (see *Finns*) and Swedes, with a few Lapps, Russians, and Germans. Up to the twelfth century the Finns lived under their own chiefs and were pagans. Their conversion to Christianity took place about the middle of that century, after their conquest by the Swedes. In 1721 the part of Finland which formed the province of Wiborg was secured to Peter the Great by treaty. The remainder was conquered from the Swedes in 1809, and Alexander I, the Czar of Russia, agreed that the laws, liberties, and religion of the country should be faithfully preserved. These resembled those of Sweden, the religion being Lutheran, though there was complete religious freedom, the government being based on the Swedish system. There was a national parliament, or diet, consisting of four estates, the nobles, the clergy, the burgesses, and the peasants, the sessions being convoked by the grand-duke, the Emperor of Russia. The senate, the members of which were nominated by the crown, held the superior administrative power, its sessions being at Helsingfors under the presidency of a governor-general, who represented the emperor. All other officials, as well as the officers of the army, were required to be Finnish subjects. Under this system of government Finland was the first part of the Russian empire, possessing a partial independence not agreeable to the czars. The agreement made by Alexander, however, was retained until 1898, when the Czar Nicholas II issued an edict restricting the rights of the people, and robbing them in a measure of their autonomous government. Other oppressive ordinances were issued from 1901 to 1903, with the purpose of bringing Finland into conformity with the remainder of Russia, but causing a rebellious discontent which, in 1904, led to the assassination of a tyrannical Russian governor-general by a Finnish patriot. The outbreak of revolutionary sentiment throughout Russia in 1905, after the war with Japan, led to a restoration of the former government of Finland. In the following years a system of universal suffrage was adopted, women being given

the right to vote and to sit in the Diet. New oppressive acts gave rise to fresh discontent when it became evident that more attempts were to be made at the Russification of Finland. The opening of the Great war pushed Finland affairs temporarily into the background, but following the revolution in Russia (1917) the separatists of Finland declared their country independent. The Bolshevik government of Russia contested this declaration, and the hostilities which broke out gave Germany her opportunity to intervene. She occupied Helsingfors in April, 1918. Recognition of the independence of Finland was made by France, Denmark and Germany.

Finland, GULF OF, a great arm of the Baltic, 250 or 260 miles long and from 10 to 70 miles wide, stretching from W. to E. between Finland on the N. and the Russian governments of Esthonia and St. Petersburg on the S. Its waters are only slightly salt. It contains numerous islands, several excellent harbors and strong fortresses.

Finlay (fin'lā), GEORGE, historian, born of Scotch parents at Faversham, Kent, in 1799; died in 1875. He was educated, chiefly at Glasgow, for the legal profession, but, stirred by the cause of Greek independence, he went to Greece in 1823, and thenceforward lived chiefly at Athens devoted to the service of his adopted country. His chief work, the *History of Greece from its Conquest by the Romans to 1864*, was published in sections under different titles: *Greece under the Romans; History of the Byzantine Empire*, etc.

Finmark (fin'mark), a division of Norway, in the extreme north, partly bounded by the Arctic Ocean. It consists of a mountainous and usually sterile tract, stretching 140 miles northeast to southwest, with an average breadth of about 40 miles. The Loffoden Islands belong to a long line of coast where important fisheries are established. The cod-fishery employs a large number of boats and men, and a great quantity of cod-liver oil is made. Pop. 32,735.

Finner. See *Finback*.

Finns, in their own language called *Suomalainen*, are a race of people inhabiting the northwest of European Russia (governments of Archangel and Olonetz), but especially the grand-duchy of Finland. In a wider sense the term Finns, with its adjective Finnic, is applied to one of the chief branches of the northern or Uralo-Altaic division of the Turanian family of peoples and languages. The Uralo-Finnic family has been divided into four groups or branches: 1, the Ugric, to which the Ostiaks, Voguls, and Magyars belong; 2, the Bulgaric or Volgaic, consisting of the Tcheremisses and the Mordvins; 3, the Permic, composed of the Permians, Sirianes, and Votiaks; and 4, the Chudic or Baltic group. To the last belong, besides the Finns proper, the Esths of Esthonia and the Lives or Livonians, the Chudes, in the governments of Novgorod and Olonetz, and the Lapps in Archangel and the northern parts of Finland, Sweden, and Norway. The typical Finns are physically of low stature but of strong build; with round head, forehead low and arched, features flat with prominent cheek bones, and oblique eyes. Their language belongs to the northern division of the Turanian or Uralo-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Hungarians. It is agreeable to the ear, rich in vowels and diphthongs, copious, and uncommonly flexible. The language is remarkably rich in declensional forms, there being as many as fifteen different cases, expressing such relations as are expressed in English by *near*, *to*, *by*, *on*, *in*, *with*, *without*, *along*, etc. There is no distinction of gender in nouns. The verb resembles the noun in its capability for expressing shades of meaning by corresponding inflections. Finnish literature is valuable chiefly for its rich stores of national poetry. These poems, which had been preserved by oral tradition from the times of heathendom, were gradually dying out, till 1835, when Lönnrot grouped together in one whole all the fragments he could lay his hands on and published them, under the title of *Kalevala*, as the national epic of the Finnish people. A second edition, increased almost by one-half, was published by him in 1849. He also published a collection of 592 ancient lyric poems and 50 old ballads, and collections of proverbs and riddles. A great impulse has been given to the cultivation of the language in modern times. It is now recognized as an official language side by side with Swedish, and is becoming more and more the vehicle for imparting instruction. In many of the higher educational institutions for both sexes in Finland the Finnish language is used. Works on science and history as well as poetry have been written in Finnish in recent years; a great Finnish-Swedish dictionary has been published, and there are now a considerable number of newspapers. The center of this literary life is the city of Helsingfors.

Fins, the projecting wing-like organs which enable fishes to balance themselves and assist in regulating their movements in the water. The fin consists of a thin, elastic membrane supported by rays or little bony or cartilaginous ossicles. The *pectoral* or breast fins are never more than two; they are placed immediately in the rear of the gill opening on the shoulder. In a state of rest these fins are parallel with

Fins of a Fish (*Perca Granulata*).
p, Pectoral. *v*, Ventral. *d*, First Dorsal. *d'*, Second Dorsal. *c*, Caudal. *a*, Anal.

the body, and have the apex towards the tail. The *ventrals*, or abdominal fins, are placed under the throat or belly, and point downwards and backwards. They are smaller, in general, than the pectorals, and have sometimes long appendages. Those of the back, or the *dorsal* fins, point upwards and backwards, and vary in number from one to four, to which sometimes are added several finlets or *pinnulæ*—small appendages which are seen in the mackerel. The *anal* fins are situated behind the vent, varying in number from one to three, placed vertically, and, like the dorsal, generally deeper on the anterior margin. The *caudal*, or tail fin, terminates the body, and both propels the fish and serves as the rudder by which it steers itself. The pectoral and ventral are known as *paired* fins, and represent the fore and hind limbs of other vertebrates; the dorsal, anal, and caudal are *median*, *vertical*, or *unpaired* fins, and are organs peculiar to fishes.

Finsbury (fins'ber-i), a parliamentary borough of England, forming part of London, bounded by the parliamentary boroughs of St. Pancras, Islington, Shoreditch, London City, and Westminster. Pop. (1911) 87,976.

Finsen Light Cure, invented by Prof. Niels R. Finsen, of Copenhagen (died Sept. 24, 1904), is used for the cure of lupus, acne, erysipelas, and similar eruptions, and in combination with x-rays for deep-seated cancers. The Finsen lamp consists of a powerful electric light focusing through telescopes of colored glass on the diseased surfaces requiring treatment.

Finster-Aarhorn (fin'ster-är'horn), the highest peak of the Bernese Alps, 14,026 feet above the level of the sea.

Finsterwalde (fin-ster-väl'de), a town in the province of Brandenburg, Prussia, with manufactures of cotton and woolen cloths. Pop. 10,726.

Fion, Fionn (fē'on), a name given in the Ossianic poetry to a semi-mythical class of warriors of superhuman size, strength, speed, and prowess. Generally they are supposed to have been a sort of Irish militia, and to have had their name from *Fion* MacCumhal (the Finn MacCoul of Dunbar, and Fingal of Macpherson), their most distinguished leader; but Mr. Skene believes them to have been of the race that inhabited Germany before the Germans and Scotland and Ireland before the Scots.

Fiord (fyord), a geographical term (of Scandinavian origin) applied to long, narrow, and very irregularly-shaped inlets of the sea, such as diversify the coast of Norway. Similar inlets of the sea are presented in the sea-lochs of the west coast of Scotland, as also in the fiords on the southwest coast of the South Island of New Zealand, where the scenery is singularly imposing. Fiords often seem to owe their origin to the action of glaciers in remote epochs of the earth's history.

Fiorin (fī'ur-in; *Agrostis alba*), or white-top, a grass found in Northern States of America. It is not of much agricultural value. A stoloniferous variety, sometimes called *A. stolonifĕra*, is often a troublesome weed.

Fir (fĕr), a name sometimes used as co-extensive with the term *pine*, and including the whole genus *Pinus*; sometimes restricted to trees of the genus *Abies*, which differ from the pines in their leaves growing singly, and the scales of the cones being smooth, round and thin. The term fir, thus limited, is applied to the different varieties of the *silver fir* and the *spruce fir*, the common silver fir being the *Abies picēa* of botanists, while the common or Norway spruce is the *Abies excelsa*. Other species are the great Californian fir (*A. grandis*), the balm of Gilead fir (*A. balsamifĕra*), the large-bracted fir (*A. nobilis*), the hemlock spruce fir (*A. Canadensis*), oriental fir (*A. orientālis*), white spruce fir (*A. alba*), Douglas fir (*A. Douglasii*), etc. The Scotch fir is

a species of pine (*P. sylvestris*). The firs, even in the widest sense of the term, are almost all remarkable for the regularity of their growth, their tapering form, and the great altitude of their stems. Their timber is often highly valuable, being almost solely used in the construction of houses, and for the spars and masts of vessels of all kinds. Some of them are planted mainly as ornamental trees. By some botanists the larch and cedar are included with the firs in the genus *Abies*. See *Spruce*, *Silver Fir*, *Hemlock*, etc.

Firbolgs (fir'bolgz), one of the legendary or fabulous tribes of the earliest period of Irish history. Some of the Irish historians begin their account of the Irish monarchy and list of kings with Slainge, the first Firbolg king, who began to reign 1934 B.C. They are said to have been driven out or subjugated by a kindred tribe from Scotland, who in turn were expelled or conquered by the Milesians. The Firbolgs may, it has been thought, corresponded to the pre-Aryan inhabitants of Ireland.

Firdusi (fir-dū'sē), or FIRDAU'SI, ABUL KASIM MANSUR, the greatest epic poet of the Persians, was born at Khorassan about 931, and died there about 1020. At the request of the Sultan Mahmud, of Ghuznee, Firdusi undertook to write an epic on the history of the Persian kings, the sultan promising him a piece of gold for each verse. Firdusi devoted a great number of years to this work, and produced an historical poem of 60,000 verses, entitled *Shanameh* ('Book of the Kings'), containing the history of the Persian rulers from the beginning of the world to the downfall of the Sassanian dynasty (632 A.D.), and consisting properly of a succession of historical epics. The sultan, prejudiced against Firdusi by the poet's enemies, gave him only a piece of silver for each verse. In return Firdusi retaliated with one of the bitterest and severest satires ever penned. The resentment of Mahmud compelled the poet to wander from court to court seeking a protection which the sovereigns were afraid to give. The *Shanameh* is one of the finest Asiatic poems. No work in the Persian language can be compared with it. It abounds in rich imagery, contains many passages of splendid poetry, and is of great interest to historians and ethnologists. A French translation of the *Shanameh* by Mohl, with the Persian text, was published by the French government.

Fire (fir), the simultaneous and vividly perceptible evolution of heat and light during the process of combustion. The uses and dangers of fire, and to some extent the means of controlling it, have been generally understood from a very early period. The symbolic and superstitious uses of fire are numerous, and have been, or are, common to all races. Anciently fire was regarded as one of the four elements of which all things are composed, the other three being *air*, *earth*, and *water*. See *Combustion* and articles following this.

Fire-alarm, an apparatus, mechanical, electrical, and telegraphic, used for detecting fires, and for giving instantaneous notice of an outbreak. Detectors are often placed in the different apartments of a building, which ring an alarm when the temperature reaches a certain height. In large towns a series of signal-boxes is distributed in different quarters from which an alarm can be immediately telegraphed to the fire-brigade station.

Fire Annihilator. See *Extincteur*.

Fire Armor, a device to protect firemen and others from the effects of smoke, gas, etc. Devices of this kind have been in use in the United States since 1823. Methods are employed to protect the face, and by a wet sponge to keep out dust, smoke and noxious gases from the lungs, while cooling the air respired. Also the firemen are supplied with fresh air through a pipe connected with the face-mask.

Firearms, a general name for all sorts of guns, rifles, fowling-pieces, blunderbusses, pistols, etc., which effect their discharge by the combustion of gunpowder.

Fireball: (1) A ball filled with powder or other combustibles, intended to be thrown among enemies, and to injure by explosion, or to set fire to their works. (2) A popular name applied to a certain class of meteors which exhibit themselves as globular masses of light moving with great velocity, and not infrequently passing unbroken across the sky until lost in the horizon. They differ from ordinary meteors, probably, more in volume and brilliancy than in any other distinctive characteristic. They are not to be confounded with another class of meteors that explode in their passage, and appear to let fall a dull red body (meteorolite) to the earth.

Fire-balloon, a balloon which is supplied with heated air from a fire beneath the mouth of the bag, and rises in consequence. Also a small balloon sent up at night with fireworks, and kindling when a certain height is reached.

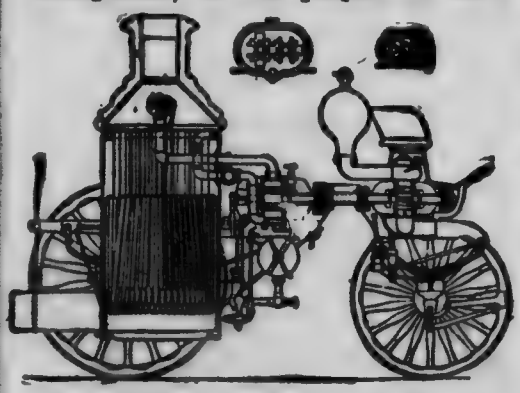
Fireboat, a small steamboat equipped with fire-extinguishing apparatus, and used when a fire breaks out on wharves or in shipping.

Firebox, the box (generally made of copper) in which the fire in a locomotive engine is placed. See *Boiler.*

Fireclay, a compact kind of clay, consisting chiefly of silica and alumina, with a small percentage of iron oxide, capable of sustaining intense heat, and used in making fire-bricks, gas-retorts, crucibles, etc. Fireclay belongs to the coal formation, and is interstratified with coal and other rocks. In the United States the supply of fireclays is chiefly from New Jersey, Missouri, Pennsylvania and Ohio.

Fire-damp, the gas contained in coal, often given off by it in large quantities and exploding, on ignition, when mixed with atmospheric air. Explosion takes place when, as is often the case, the coal consists largely of marsh-gas (light carbureted hydrogen). The composition of the gas evolved from coal is variable, but in connection with the marsh-gas, oxygen, carbonic acid and nitrogen are always present. Fire-damp is a source of great danger to life in coal mines.

Fire-engine, an engine designed to throw a continuous stream of water through a hose upon a conflagration, for the purpose of extinguishing it. Fire-engines are of three principal kinds: hand-power, steam and chemical. Hand-power engines, consisting in the main of a pair of single-acting force-pumps, mounted on wheels and worked by hand, have been generally superseded by steam fire-engines, consisting of a pair of single-acting suction and force-pumps operated by steam. Chemical fire-extinguishers are of various kinds, but mainly depend on the rapid production of carbonic acid gas, which is mixed with water.



Vertical Section of Platform-spring Steam Fire-engine.

The most powerful land steam engine, with a boiler steam pressure of 160 pounds per square inch, can develop a pump pressure of 300 pounds per square inch, and is rated to discharge 1100 gallons of water per minute for fire service.

The practice is to lay 3-inch hose close in to the fire, and finish out with 2½-inch hose as being more expeditiously and safely handled. Each of these streams should be handled by not less than four men. While in the house the water in the boiler is kept continuously at a steam pressure of 20 pounds to the square inch by a stationary water-heating apparatus, so that the engines are ready to pump water whenever they leave the engine house. Horse-drawn fire engines have three horses, as do the hook and ladder trucks.

Motor propelled and operated fire apparatus have been greatly improved in recent years. The types are numerous. Among them are the ordinary steam fire engine, the front wheels and axle of which have been removed and a short four wheel chassis substituted, making it a six-wheeler, the motor simply replacing the horses, and the pumps being operated by steam from the boilers, as formerly.

The chemical fire engine is a valuable adjunct to fire department equipment, and nearly every fire department in the country has one or more chemical outfits. The one most generally used is known as the 'combination wagon,' and carries one or more chemical tanks and a complement of hose, ladders and other light fire appliances. The cities of Baltimore, Detroit, Los Angeles, Philadelphia, St. Louis and Washington operate a considerable number of chemical outfits, specializing gas-impregnated water for small enclosed fires, the practice being to lay in the chemical hose and water first, following them up, if necessary with a larger hose and water, or to save 'water damage' to use the small hose for hydrant or engine stream when the chemicalized water has been exhausted.

'Chemicals' are extensively used in sections where water is not available.

Fire-escape, a contrivance for enabling persons to escape from the upper part of a building which is on fire. It is composed of an arrangement of long ladders. A net is used for lowering people unable

to descend the ladder. Other kinds of fire-escapes are cords coiled in a sleeping apartment, which may be attached to a window; ropes with weights at one end, which may be thrown into windows; poles with baskets attached, and other devices usually. In American cities fire-escapes consisting of iron stairways or ladders are required on all high buildings. The 'Philadelphia fire-escape' is a bricked-in iron stairway, the only entrances to which are on the outside of the building, approached by iron balconies from all floors, with the exit on the street.

Firefly, a name indefinitely given to any winged insect which possesses much luminosity. Except the lantern-fly, the fireflies are all coleopterous, and are members of two nearly allied families, the Elateridæ or skipjacks, and Lampyridæ, to which the glowworm belongs. The British glowworm has too little luminosity to entitle it to the name of firefly, but the *Lampyris Italica*, and *L. corusca* of Canada are allied to it. True fireflies are found only in the warmer regions of the earth. The *Elater* or *Pyrophorus noctilucus* of South America and the West Indies is one of the most brilliant, giving out its light from two eye-like tubercles on the thorax. Their light is so powerful that small print may be read by it, and in Hayti they are used to give light for domestic purposes, eight or ten confined in a vial emitting sufficient light to enable a person to write.

Fire-hose. In the United States hose is made of cotton woven into a tube by machinery, two such tubes being fitted within each other and held together by a solution of India rubber, which renders them fireproof.

Fire Insurance, insurance against loss by fire. See *Insurance.*

Firelock, a musket or other gun, with a lock furnished with a flint and steel, by means of which fire is produced in order to discharge it; distinguished from the old matchlock, which was fired with a match.

Firemaking. The oldest method of making fire was by the friction of a stick rubbed in a groove. A later was the fire drill, a stick twirled by a string. A later method was by striking iron and flint together and thus producing sparks. Before the invention of the lucifer match the hearth-fire was kept alive all night. The match was preceded by a phosphorus bottle and other less satisfactory devices.

Fire Ordeal. See *Ordeal*

Fireproofing. Various plans have been adopted for rendering houses or an apartment in a house fireproof, as by constructing them entirely of brick or stone, and employing iron doors, ties and lintels, stone staircases and landings. In the case of textile fabrics, as cotton, linen, etc., saturation with various salts, as borax, is employed, these leaving their crystals in the substance of the fabrics. Wood is best protected by silicate of soda, which, on the application of strong heat, fuses into a glass, and this, enveloping not only the outside but also the internal fibers of the wood, shields it from contact with the oxygen of the air. Fireproof safes are generally constructed with double walls of stout iron, having a space between the walls filled with some substance which is a very bad conductor of heat.

Fire-raising, in Scotch law, is the same as arson in English law. In Scotland it is a capital crime in some cases, but capital punishment is not now inflicted. See *Arson.*

Fireships are generally old vessels filled with combustibles, and fitted with grappling-irons, to hook enemies' ships and set them on fire. This ancient device has been frequently tried in modern warfare, though it can never be of much effect when employed against modern ships.

Fireworks, preparations in various shapes of gunpowder, charcoal, sulphur, saltpeter, filings of iron, etc., used for display at times of public rejoicing, etc. They may be divided into simple hand pieces, such as squibs, crackers, rockets, Roman candles, etc., and arranged 'pieces,' which are contrived with much skill and ingenuity to represent, when ignited, various devices and pictures.

Fire-worship, the worship of fire, the highest type of which worship is seen in the adoration of the sun, not only as the most glorious visible object in the universe, but also as the source of light and heat. In the early religion of India the sun appears in the form of the god Agni (a name akin to Lat. *ignis*, fire), what was first regarded as a mere abstract influence or a phenomenon in time being regarded as a sentient individual. Thus in the Vedic hymns Agni is the god of fire, corresponding to the Greek Hephæstos (Vulcan). In the East the worship of the element of fire was practised by the ancient Persians or Magians, and is continued by the modern Parsees. The establishment of this species of idolatry among the Persians is ascribed to Zoroaster, who taught

his disciples that in the sun and in the sacred fires of their temples God more especially dwelt, and that therefore divine homage was to be paid to these.

Firishta. See *Ferishta*.

Firkin (fėr'kin), an old measure of capacity, being the fourth part of a barrel, or equal to 7½ imperial gallons.—A small cask or keg of indeterminate size.

Firmament, the vault of heaven. The Hebrew word *rakia*, which is so rendered in Scripture, conveys chiefly the idea of expansion, although that of solidity is also suggested, inasmuch as the root signification of the word is that which is expanded by beating out. The English *firmament* is derived from the Latin *firmamentum*, which is the equivalent of the Greek *stereoma* (*stereos*, firm, solid), by which the writers of the Septuagint rendered the word.

Firman (fėr'man; Per. *fermân*), a decree, order, or grant of an Oriental sovereign, as of Turkey, issued for various special purposes, for instance to ensure a traveler protection and assistance. It differs from a *Hatti Sherif* in so far as it may be signed by any minister, whereas the Hatti Sherif is approved by the Sultan himself with his special mark, and is therefore supposed to be irrevocable.

Firn, the more or less compacted mass of snow which furnishes the material from which glaciers are formed, called also *névé*.

Firolidæ (fir-ol'i-dē), a family of gasteropodous molluscs, belonging to the order Nucleobranchiata or Heteropoda. The members of the typical genus *Firola* are very common in tropical seas and in the Mediterranean, but are so transparent that sometimes they can scarcely be seen. They swim with their foot upwards. They have no shell. The individuals of *Carinaria*, another genus, have a small delicate shell enclosing the gills.

Firozábád (fē-rō-zā-bād'), a town and municipality in Agra district, Northwestern Provinces of India, headquarters of a tahsil of the same name, 24 miles E. of Agra. It contains numerous ruins of handsome buildings; is a station on the E. Indian Railway, 817 miles from Calcutta. Pop. 16,023. Pop. of tahsil or revenue district, 108,521.

Firozpur (fē-rōz-pur'), a thriving commercial town, Punjab, India, capital of a district of the same name. The arsenal is the largest in the Punjab. Pop., including the military cantonments, 2 miles S. of the city, 50,437. The district forms the most southern of the Lahore division. Area, 2752 sq. miles.; pop. 650,519.—Firospur is also the name of a town in Gurgaon district, Punjab. Pop. 6878.

First-fruits, in the Church of England, the income of every spiritual benefice for the first year, paid originally to the crown, but now to a board, which applies the money so obtained to the supplementing of the incomes of small benefices. See *Annates*.

Firth, Frith, an estuary, a term applied in Scotland to arms of the sea, such as the Firth of Clyde, of Tay, and of Forth, etc. It is the same word as the Norwegian *fiord* (which see).

Fischart (fish'ärt), Johann, a German satirist, born between 1545 and 1550; died in 1589. His writings are mostly satirical, partly in prose, partly in verse, partly of both mixed together, and have the most whimsical titles. As a satirist he is the most unrestrained of his age, the papal dignity, and the lives of the priesthood and Jesuits, astrological superstition, scholastic pedantry, etc., being among his favorite subjects of attack.

Fish Commission, established in the United States in 1871 for fostering the fishing industries by distributing food-fishes. It has done admirable work by its study of the locality, food and habits of edible fishes, their propagation, and the distribution of the young in great numbers in suitable waters. It has also made valuable deep-sea explorations. State Fish Commissions are in existence throughout the country.

Fish Culture. See *Pisciculture*.

Fish, Hamilton, an American statesman, born in New York City in 1808; died in 1893. He graduated at Columbia and was admitted to the bar. He was a Whig representative in Congress, 1843–45; a member of the state senate in 1847; and governor of New York, 1849–51. He was a member of the U. S. Senate, 1851–57, and vigorously opposed the Kansas-Nebraska Bill. During the Civil war he threw all his influence on the side of the national administration, and after the war he was secretary of state in Grant's cabinet (1869–77).

Fisher, Sydney George, author, was born at Philadelphia, Pa., in 1856; studied law at Harvard and was admitted to the bar in 1888. His works are historical in character, including *Men, Women and Manners in Colonial*

Times; The Evolution of the Constitution of the United States, etc.

Fisher, JOHN, Bishop of Rochester, was born in 1459, at Beverley, in Yorkshire. He was made chancellor of the University of Cambridge in 1501 and Bishop of Rochester in 1504. He opposed Henry VIII's divorce; listened to the pretended prophecies of Elizabeth Barton, the Maid of Kent; opposed the royal supremacy, and was imprisoned in 1534 and attainted. His appointment as cardinal by Paul III led to his execution after trial by a special commission, 1535.

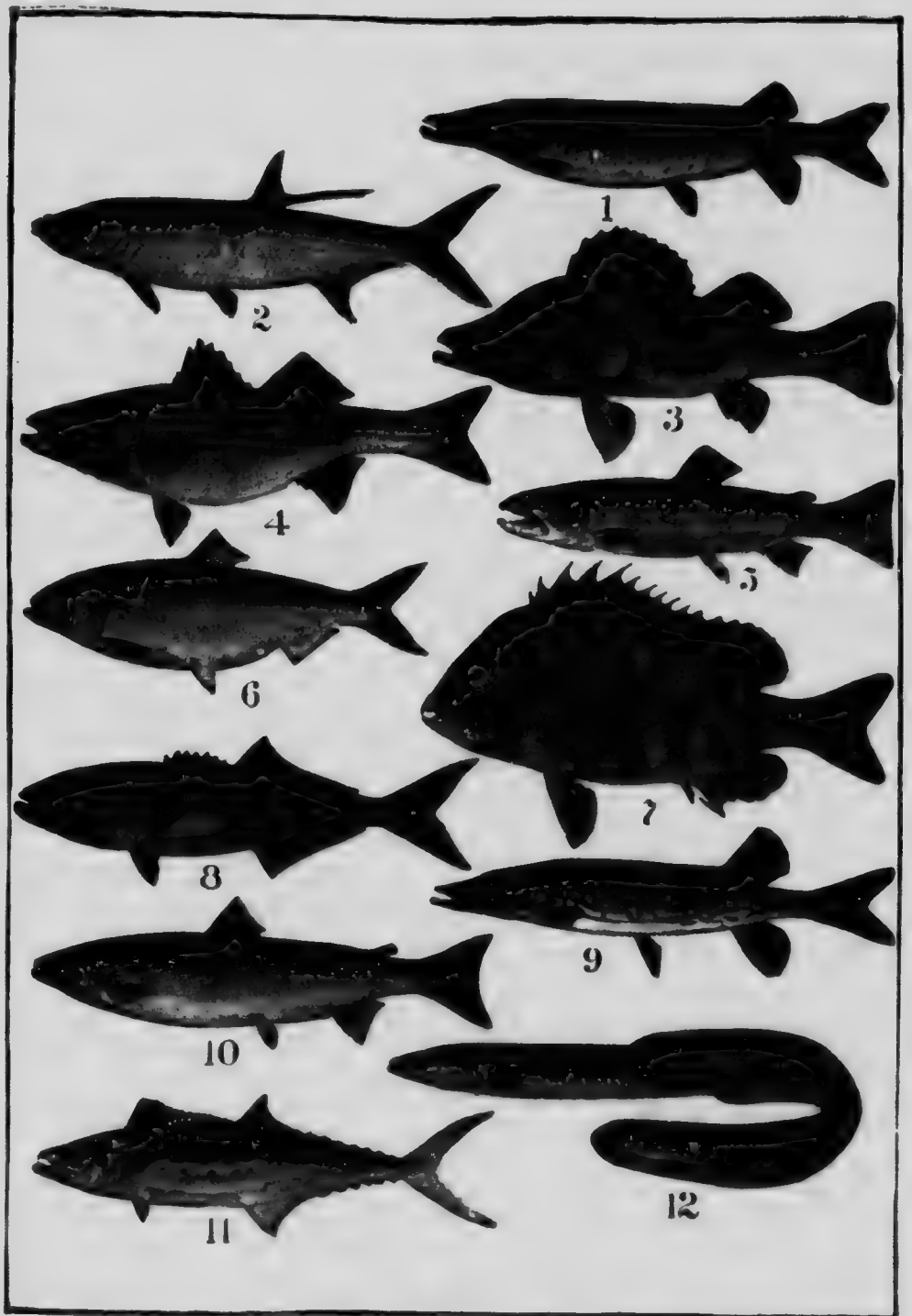
Fisheries (fish'er-ēz), a term which includes all the industries concerned in the capture of the inhabitants of fresh and salt water for food and other economic purposes. It is thus applied to the procuring not only of fish proper, but also of other animals and products found in the sea, such as sponges, corals, pearls, shellfish, turtles, whales, seals, etc. Fresh-water fisheries include those of salmon, shad, alewives, sturgeons, trout, pike, perch, etc. Sea-fisheries include the herring, cod, haddock, and various other fishes, and are prosecuted in a variety of ways. Of nets the chief varieties are trawls, drift-nets, seines, bagnets, and trammel or set nets, while hand line and long line fishing are widely prosecuted. Fisheries have generally been considered so important an object of national wealth that governments have been careful to protect and encourage them in various ways. The right to various fisheries has often been a matter of international disputes, negotiations, and treaties. Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the mode of capture, etc., which vary with the particular circumstances in each case.

The countries whose fishing industries yield the most valuable results are the United States, Great Britain, Japan, Canada, Norway, France, and Russia. The United States surpasses all other countries in value of fisheries, having annual returns worth over $75,000,000, or $90,000,000 if the island possessions be included. The yield of Great Britain is valued at about $50,000,000, of Japan at $65,000,000, of Russia at $30,000,000, of Canada at $35,000,000, of other countries at over $200,000,000, the world's total being about $500,000,000.

The banks of Newfoundland are one of the richest fishing grounds in the world, and are largely frequented by French fishermen. The German Ocean also yields an exceedingly rich harvest, especially in herring, cod, haddock, flat fish, etc.

Fishery Question, the Canadian. Under the treaty of 1783, at the close of the Revolutionary War the fishing banks, coasts, bays, and creeks of Canada were thrown open to the fishermen of the United States, but since the close of the War of 1812 these fisheries have been a source of continued controversy. The British Peace Commissioners in 1814 held that the second war had destroyed the first treaty, while the Americans maintained that the rights granted by it could not be revoked. An attempt was made in 1878 to settle the dispute by granting American fishermen the right to fish outside the limit of three marine miles from the Canadian coast. The question of the right to fish in the Gulf of St. Lawrence and the large Canadian bays remained a matter of dispute until 1871, when by treaty the fisheries of each country were thrown open to the others. But as the right to fish in American waters was of no use to Britain, that country claimed damages for the right to fish in Newfoundland and inshore waters for twelve years, the limit of the treaty. Arbitration followed and the sum of $5,500,000 was awarded. In 1888, on the expiration of this treaty, another was negotiated, but the United States Senate refused to ratify it, and the question continued open. The constant old controversy was in the end submitted to The Hague Court for arbitration and a decision was rendered in 1910, with which both nations professed to be satisfied, the United States winning on five of the points in question, Great Britain on the two most important ones.

The points gained by the United States gave fishermen the right to employ foreign crews in their boats, to exercise the same commercial privileges (such as the purchase of boat and supplies) as are accorded to trading vessels generally, to exercise the same privileges on the coast of Newfoundland as in Labrador, and to be exempt from light, harbor, and other duties imposed on Labrador. Those gained by Great Britain were the following: In measuring the three miles from the coast within which fishing was prohibited, it was decided that in the case of large bays the base line should be drawn from headland to headland across the bay, instead of following the sinuosities of the coast. The second point gave Great Britain the right to make reasonable regulations for fishing in Canadian waters. But it was decided that in case such regulations should be disputed as



AMERICAN FRESH AND SALT WATER FISH

1. Muskellunge. 2. Tarpon. 3. Yellow perch. 4. Striped bass. 5. Brook trout. 6. Shad. 7. Sheepshead. 8. Blue fish. 9. Pickerel. 10. Land-locked salmon. 11. Spanish mackerel. 12. Common eel.

unreasonable the disputed point or points were to be settled by arbitration. On the whole, both countries declared themselves satisfied with the decision, and a fruitful source of disaffection between the two nations was removed.

Fish-hook, a curved, barbed, and pointed steel wire used for catching fish. The Limerick hook, which has the greatest reputation, has a barb that is forged solid, and then filed into the proper shape, while ordinary hooks have a barb that is raised by cutting into the wire. Hookmaking machines are now common, especially in the United States.

Fish-joint, a spice or joining, as in railways, where two rails end to end are fastened together by flat pieces of iron (*fishplates*) placed on each side of the rails, and fastened by screw-nuts and bolts (*fishbolts*).

Fish-louse, a general name for those of the *Copepoda* which are parasitic upon fish. The name is also applied to certain of the *Isopoda* which have the same parisitic habit.

Fisk, CLINTON BOWEN, soldier and official, was born at Griggsville, New York, in 1828; died in 1890. He engaged in the Civil war, enlisting as a private, and rising to the rank of brevet-brigadier-general of volunteers. After the war he held positions in the Freedman's Bureau and in other service, in 1886 was the candidate of the Prohibition party for governor of New Jersey, and in 1888 for president of the United States. He was one of the founders of Fisk University, Tennessee.

Fiske (fisk), JOHN, author, was born at Hartford, Connecticut, in 1842; died in 1901. He became a lecturer on philosophy at Harvard and subsequently assistant librarian. He published *Myths and Mythmakers*, *Outlines of Cosmic Philosophy*, *The Destiny of Man*, and other philosophic works, and subsequently produced a series of books on American history, including *The Critical Period of American History*, *American Political Ideals*, etc. He was very popular in both these fields of literature.

Fiske, MINNIE MADDERN, an American actress, born in New Orleans, Louisiana, in 1865; made her first appearance on the stage at the age of three and at fifteen became a star. In 1890 she married Harrison Grey Fiske, editor of the *Dramatic Mirror*. She has starred in various plays with signal success, one of the favorites being *Becky Sharp*.

Fismes (fēme), an arrondissement of Rheims, department of Marne, France, on the Vesle River. Pop. 3410. It fell into the hands of the Germans in May, 1918, in one of the last great drives of the enemy in the European war (q. v.). The Germans drove in a salient from Soissons to Rheims, Fismes being in the center of the stroke. They pushed the Allies back from the Vesle to the Marne, but at Château-Thierry (q. v.) they were stopped by American troops, who held the line for several weeks. The counter attack began July 19, and by August 1 Fismes had been recovered and the enemy was in flight behind the Vesle.

Fission (fish'un), in physiology, reproduction by division of one animal of low type into two, each of these, again, dividing into two others, and so on. The products of the division of the body of the primitive organism may either remain undetached, when they will give rise to a composite structure (as in many corals), or they may be thrown off and live an independent existence. The bacteria that cause disease are regarded as fission fungi.

Fissirostres (fis-i-ros'trēz), a tribe of the Insessores or perching birds, distinguished by having a very wide gape, extending beneath the eyes. It comprehends the night-jars or goat-suckers, whip-poor-will, swallows, swifts, martins, etc. But in modern classification this division is often disregarded.

Fissurellidæ (fis-ū-rel'i-dē), the key-hole limpets, a family of gasteropodous molluscs resembling the limpets in appearance and habits, but differing considerably in structure. The animal is generally too large for the shell, so that in the typical genus *Fissurella* the shell appears as if it were rudimentary. The species are widely distributed: many are British, and many fossil.

Fistula (fis'tū-la), in surgery, a channel open at both ends excavated between an internal surface and the skin surface, showing no tendency to heal, and generally arising from abscesses. It occurs most frequently at some outlet of the body, as the urinary passages and anus.

Fistularia (fis-tū-lā'ri-a), a genus of acanthopterygious fishes characterized by the elongation of the facial bones into a long fistula or tube at the extremity of which the mouth opens. A notable species is the tobacco-pipe fish.

Fitch, JOHN, inventor, was born at East Windsor, Connecticut, in 1743; died in 1798. After being captured by Indians in Kentucky about 1780, and exchanged, he devoted himself to the application of steam to navigation, producing a model of a steamboat in

1785. A boat made by him came on the Delaware in 1787 with some success, and a boat completed in 1790 made regular trips on the Delaware for some time. He gained no profit from his invention and died in poverty. His boats were moved by paddles, instead of by wheels, as in Fulton's invention. In 1817 a committee of the New York Legislature decided that he was the inventor of the steamboat.

Fitchburg (fich'burg), one of the county seats of Worcester County, Massachusetts, on the Nashua River, 50 miles N. W. of Boston; on the B. and M. and N. Y., N. H. and H. R. R. It has manufactures of wooden toys, files, paper, cotton, and woolen goods, machinery, and engines. Pop. 41,700.

Fitchet (fich'et), or FITCH, the fur of the polecat. It is a yellow ground, with long, soft, black shining hairs on its surface, which are exclusively used for artists brushes. The fur is not in great request as it emits an unpleasant odor which is difficult to dissipate. See *Polecat*.

Fitz, the old French word for *fils*, son; used as a prefix in certain surnames, as *Fitz*gerald, *Fitz*herbert, *Fitz*maurice, *Fitz*william, especially in the surnames of the illegitimate sons of kings or princes of the blood, etc.; as, *Fitz*roy, *Fitz*clarence.

Fitzgerald (fits-jer'ald), FAMILY OF, an Irish family descended from William, Castellan of Windsor in William the Conqueror's reign. Two branches of this house, the Earls of Desmond and Kildare, were for long the practical rulers of the English part of Ireland. The Kildare branch is still represented by the ducal house of Leinster.

Fitzgerald, LORD EDWARD, born near Dublin 1773; died 1798. He was a younger son of the Duke of Leinster, and married Pamela, the reputed daughter of the Duke of Orleans (Égalité) and Madame de Genlis. In 1796 he joined the United Irishmen, and plotted for a French invasion of Ireland; was betrayed by a spy, and arrested. He stabbed two of the officers sent to take him, but was disabled by a pistol-shot, which caused his death before he could be brought to trial.

Fitzgerald, LORD THOMAS, known as 'silken Thomas,' born about 1513; died in 1536. He was vice-deputy for his father, the ninth earl of Kildare, on whose arrest by Henry VIII Lord Thomas raised a formidable revolt in Ireland, which was ultimately put down by Skeffington, and Lord Thomas with his five uncles was hanged at Tyburn.

Fitzgerald, a city in Ben Hill County, Georgia, 25 miles N. E. of Tifton. It has iron-works, cotton-seed-oil mills, etc. Pop. 5795.

Fitzpatrick, BENJAMIN, an American statesman, born in Green county, Georgia, in 1802; died in 1869. He practiced law from 1821 to 1829, when his health broke down and he became a farmer. He was governor of Alabama, 1841–45, and U. S. Senator, 1848–49 and 1853–61, resigning when Alabama seceded and taking an important part in the war. At its close he was chosen president of a convention called to frame a new constitution.

Fitzpatrick, SIR CHARLES, a Canadian politician, born in Quebec, December 19, 1853; was graduated at Laval University and admitted to the bar in 1876. He was a member of the Quebec Assembly, 1890–96, as a Liberal; was then elected to the Dominion Parliament and was appointed solicitor-general in Sir Wilfrid Laurier's ministry. He was minister of justices, 1901-06, and in 1906 became chief-justice of Canada and deputy governor-general.

Fitzroy (fits-roi'), ROBERT, an English admiral and meteorologist, born in 1805; died by his own hand in 1865. He entered the navy in 1819; from 1828 to 1836 was employed in hydrographical surveys; and was governor of New Zealand, 1843–45. He published *Narrative of the Surveying Voyages of the Adventure and Beagle*, 1839. In 1857 he was promoted to the rank of rear-admiral; in 1863 to that of vice-admiral.

Fiume (fē-ō'mā), a seaport town on the Gulf of Quarnero, in the N. E. extremity of the Adriatic. In 1471 Austria took control of it; in 1779 it was attached to Hungary; severed from Austro-Hungarian control by the treaty of 1919. (See *Treaty*.) D'Annunzio (q. v.) occupied Fiume in the name of Italy, Sept. 15, 1919. Pop. 50,000.

Five Forks, BATTLE OF, a battle fought on April 1, 1865, at Five Forks, Va., between a Federal force of 25,000 under General Sheridan and an inferior Confederate force under General Pickett. It settled the fate of Petersburg, which was evacuated by the Confederates on April 3, and placed General Grant in possession of the Southside Railroad. The Federal loss was less than 1000; that of the Confederates probably about 8000.

Fixed Alkalies, potash, soda, lithia, and oxides of the rare metals rubidium and cæsium.

so named in contradistinction to ammonia, which is termed volatile alkali.

Fixed Oils. See *Oils.*

Fixed Stars, those stars which appear to remain always at the same distance from each other and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, with their moons, and the comets. See *Stars.*

Fixtures (fiks'tūrs), in law, are accessories annexed to houses or lands, which by the fact of their being so annexed become a part of the real property and pass to the freeholder, not being removable at will by the tenant or occupier of the property. The general rule of law is that whatever has been affixed to the premises or put into the land by a tenant during his occupancy cannot be removed without the landlord's consent. Large exceptions are made to this rule in favor of the tenant, covering generally fixtures for trade, for agricultural purposes, and for ornament or convenience; but the removal must not injure the land or buildings of the landlord.

Flag, a piece of cloth on which certain figures or devices are painted, impressed, or wrought, borne on a staff or pole, and usually employed to distinguish one company, party, or nationality from another. In the army a flag is a banner by which one regiment is distinguished from another. Flags borne on the masts of vessels not only designate the country to which they belong, but also are made to denote the quality of the officer by whom a ship is commanded. In the United States Navy distinctive blue flags with four, three, and two white stars, are worn at the main, fore, and mizzen by admirals, vice-admirals, and rear-admirals, respectively. Commodores have a broad blue pennant, with one white star, which is worn at the main when the commodore is acting as commander-in-chief. Any officer commanding a vessel, except one on board of which a flag or broad pennant may be worn, shall wear a narrow pennant at the main. When powder is being taken on board a red flag is hoisted at the fore. A yellow flag is the quarantine flag. Flags of truce are white, and on water are met by a boat or vessel from the senior officer's vessel in charge of a commissioned officer, having a white flag. To lower or *strike* the flag is to pull it down, or take it in, out of respect or submission to superiors. To lower or strike the flag in an engagement is a sign of yielding. A sign of mourning is to hoist the flags at a half or two-thirds of the height of the masts; if on land, at half the height of the staff. Besides the use of flags as distinguishing emblems, a very important use of them at sea, both by national and mercantile navies, is as signals according to an arranged code. See *Flag of the United States.*

Flag, a popular name for many endogenous plants with sword-shaped leaves, mostly growing in moist situations; but sometimes particularly appropriated to *Iris Pseudacŏrus*, nat. order Iridaceæ; also termed *Flower de lis* or *Flower de luce.* It has sword-shaped leaves and yellow flowers, grows in marshy places and by the sides of streams and lakes. The stout creeping root-stock has been recommended for alleviating the toothache, and is used for dying black in the Hebrides. The leaves make excellent thatch, and are also employed for making bottoms to chairs.

Flagellants (flaj'el-ants; Latin *flagellare*, to lash or scourge), the name of a sect in the thirteenth century who maintained that flagellation was of equal virtue with baptism and other sacraments. They walked in procession with shoulders bare, and whipped themselves till the blood ran down their bodies, to obtain the mercy of God and appease His wrath against the vices of the age. Rainer, a hermit of Perugia, is said to have been its founder in 1260. He soon found followers in nearly all parts of Italy. Their number in time amounted to 10,000, who went about, led by priests bearing banners and crosses. They went in thousands from country to country, begging alms. For centuries they formed a sort of intermittent order of fanatics, frequently reappearing here and there in times of extraordinary declension or distress.

Flageolet (flaj'e-let), a small wind-instrument of music, played by means of a mouthpiece. The tone produced is similar to that of the piccolo, but is softer in quality, and the range is two octaves. The double flageolet consists of two instruments united by one mouthpiece, and producing double notes. The name *flageolet tones* is given to those harmonic tones on the violin, violoncello, and other stringed instruments produced by the finger lightly touching the string on the exact part which generates the harmony, and not by pressing the string down to the fingerboard.

Flag-officer, in the navy, a general distinguishing title for an admiral, vice-admiral, and rear-ad-

miral, who have the right to carry flags indicating their rank at the mast-head.

Flag of the Prophet, the *Sanjak-sherif*, or sacred flag of the Mohammedans. It was originally composed of the turban of the Koreish captured by Mohammed; but the black curtain that hung in front of the door of Ayesha, one of Mohammed's wives, was afterwards substituted. It is preserved in the seraglio at Constantinople. The carefully-guarded banner unfolded at the commencement of a war is not the real sacred flag, though it is commonly believed to be so.

Flag of the United States. Previous to the adoption of a nation flag by Congress, several flags of different patterns were used in the course of the period of stress which culminated in the Revolution. One of these bore the device of a rattlesnake, the suggestion of which appeared as early as 1751, when it was shown in Franklin's '*Pennsylvania Gazette*'; three years later, in the form of a severed snake whose parts were identified by the initials of the thirteen colonies, with the motto, 'Unite or die!' it was used to urge union of the colonies to resist the French and Indian invasion. Later the rattlesnake became a suggestive emblem of the colonies and was used by newspapers to express the spirit of the colonies in relation to the mother country. The '*Pennsylvania Journal*' incorporated it in its heading in 1775. John Paul Jones is said to have been the first to hoist an American flag on an American vessel, in December, 1775, when he was serving as first lieutenant on the 'Alfred' in Philadelphia. This ensign was of the rattlesnake design, but according to Sherburne in his '*Life of Paul Jones*' the snake was not coiled but 'running,' and that the field consisted of 13 red and blue stripes; other authorities claim that the device was a pine tree with the snake coiled about its roots. Still another claim is that the first American flag was hoisted on the 'Black Prince,' on December 3, 1775. When the first national fleet of regularly commissioned ships sailed down the Delaware in December, 1775, Barry got free of the Capes in the 'Lexington,' but the other vessels were caught in the ice and did not get clear for some weeks, by which time the fleet all carried the Union Flag. It was in this year that Abram Markoe, organizer and then captain of the 'City Troop,' Philadelphia's famous mounted body, designed and presented to the troop a flag that is of the greatest interest as being the first that bore the thirteen stripes symbolizing the thirteen colonies that were then asserting their rights in relation to the mother country. In this year also, April 23, Connecticut had a flag bearing as device the arms of the colony and the motto '*Qui transtulit sustinet*'; Putnam, on July 18, 1775, unfurled a flag with a red ground bearing the motto of Connecticut on one side and on the reverse 'An Appeal to Heaven.' Moultrie, on James Island, South Carolina, hoisted a blue flag, with a crescent in the corner for the Union. The same autumn the Philadelphia floating-batteries carried a white flag, a tree in the field and the motto 'An Appeal to Heaven.' In February, 1776, the flag of the commander-in-chief of the American Navy was presented to the South Carolina Congress by Christopher Gadsden; it had a yellow field, with a lively representation of a rattlesnake in the middle in the attitude of going to strike and the words underneath: 'Don't tread on me!' The Provincial Congress of Massachusetts voted on April 20, 1776, that the flag of the cruisers of that colony should be white with a green pine tree and bearing an inscription 'An Appeal to Heaven.'

On January 2, 1776, the Great Union Flag was unfurled at Washington's camp on Prospect Hill, Cambridge, Massachusetts. In it the solid red of the British flag was replaced by thirteen stripes with the Union of the British Union Jack. This flag was generally used until the new national flag, itself a modification of the Great Union Flag, was adopted a year and a half later.

On June 14, 1777, Congress by a resolution outlined the design of the National flag 'to be thirteen stripes alternate red and white; that the Union be thirteen stars, white in a blue field, representing the new constellation.' This flag was first used by General Gates. When the victorious Americans marched General Burgoyne's soldiers off the field on his surrendering, on October 17, 1777, they 'proudly unfurled their new flag.' The stars and stripes were also probably at Brandywine and Germantown, but certainly they flew at Valley Forge. On the admission of Vermont and Kentucky in 1791, two stripes and two stars were added, and in 1794 Congress decreed that after May 1, 1795, 'the flag of the United States be fifteen stripes alternate red and white and that the Union be fifteen stars white on a blue field.' It was intended that a new stripe and a new star should be added to the flag for each new State admitted to the Union, but it became apparent that if this plan were carried out the flag would grow too large, consequently Congress resolved, on April 4,

1818, that the number of stripes should be reduced to the original number of thirteen, representing the colonies, and that only a star should be added to the field on the admission of a new State. This design was made by Samuel Chester Reid, a naval officer, of New York, who invented the signal telegraph at the Battery and the Narrows. Since that time twenty-eight new stars have been added to the flag, which now bears thirteen stripes and forty-eight stars.

Tradition credits the making of the first 'Stars and Stripes' to Mrs. Elizabeth Ross, in a house later known as No. 80 Arch Street, Philadelphia, and many patriotic and romantic stories have been published relating thereto. It would seem that the claim made in Betsy Ross' favor is not without meeting historical support.

It is interesting to note that the first man to carry the American flag around the world was Robert Gray, the discoverer of the Columbia River. He flew it on the 'Columbia' in her voyage lasting from September 30, 1787, till 1790.

Flagship, a ship in which an admiral, or the commander of a squadron, hoists his flag.

Flahaut de la Billarderie (flä-ō de là bē-yär-drē), Auguste Charles Joseph, Comte de, French general and diplomatist, born 1785; died 1870. He had a brilliant career under Napoleon I, but on the return of the Bourbons he left France and lived in exile from 1815 to 1830. He married in England the daughter of Admiral Keith, who became Baroness Keith in 1823. He returned to France in 1830, and was ambassador successively at Berlin, Vienna, and London.

Flambard (flam'bard), Ralph, a Norman of humble origin who became the chief minister of William Rufus. His flagrant extortions earned the hatred of the people, and his character is painted in the blackest colors by the chroniclers. He was made Bishop of Durham; but on the death of William he was committed to the Tower, from whence he escaped, and instigated Robert, Duke of Normandy, to invade England. He was subsequently restored to Durham, where he lived peaceably till his death in 1128.

Flambeau (flam'bō), a sort of torch or light made of thick wicks covered with wax or other inflammable material, and used at night in illuminations, processions, etc.

Flamborough Head (flam'bur-ō), a headland on the east coast of England in Yorkshire. It consists of a lofty range of chalk cliffs about 6 miles long and from 300 to 450 feet high. On the extreme point of the promontory, at a height of 214 feet above sea-level, is a lighthouse 87 feet high, with a revolving light visible from a distance of 20 miles.

Flamboyant (flam-boi'ant), a style of Gothic architecture in use in France about the same period with the Perpendicular style in England, that is from the 14th to the 16th century. It was distinguished by the waving and somewhat flame-like tracery of the windows, panels, etc., and is usually regarded as a decadent variety of the decorated Gothic. The moldings in this style are often ill combined. The pillars are often cylindrical, either plain or with a few of the more prominent moldings of the arches continued down them, without any capital or impost intervening. The arches are usually two-centered, sometimes semicircular, and, in later examples, elliptical.

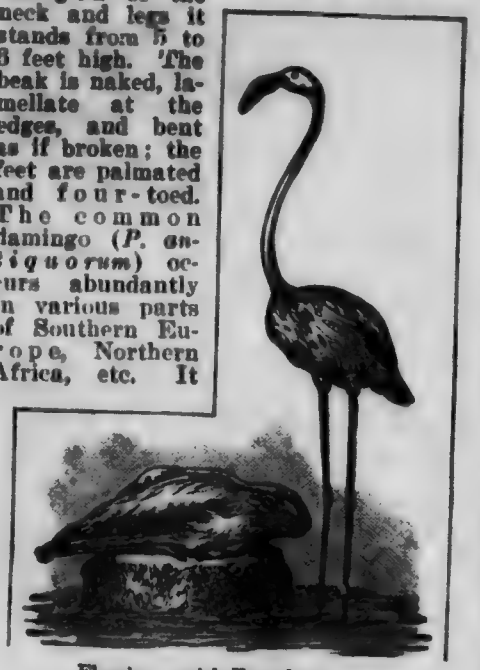
Flamboyant Tracery, St. Ouen, Rouen.

Flame (flām), a blaze rising from a burning body, or any inflammable gas in a state of visible combustion. Flame is attended with great heat, and sometimes with the evolution of much light; but the temperature may be intense when the light is feeble, as is the case with the flame of burning hydrogen gas. The flame of a candle may be divided into three zones: an inner zone containing chiefly unburned gas, another zone containing partially-burned gas, and an outer zone where the gas is completely consumed by combination with the oxygen of the air. The luminosity of flame depends upon the presence of extremely small particles of solid matter (usually carbon) or of dense gaseous products of combustion. When the pressure of the gas producing the flame is so great that it is all but flaring, it is found that certain sounds will cause the flame to alter its shape, thus producing *sensitive flames*.

Flamen (flā'men), among the ancient Romans the name given to any priest devoted to the service of one particular deity. Originally there were three priests so called: the *Flamen Dialis*, consecrated to Jupiter; *Flamen Martialis*,

sacred to Mars; and *Flamen Quirinālis*, who superintended the rites of Quirinus or Romulus; but the number was ultimately increased to fifteen, the original three, however, retaining priority in point of rank, being styled *Majŏres*, and elected from among the patricians, while the other twelve, called *Minŏres*, were elected from the plebians.

Flamingo (fla-min'go), a bird of the genus *Phœnicopterus*, formerly placed in the order of wading birds, but now generally ranked among the Natatores or swimmers, and constituting a family Phœnicopteridæ, allied to the Anatidæ or ducks. Its body is smaller than that of the stork, but owing to the great length of the neck and legs it stands from 5 to 6 feet high. The beak is naked, lamellate at the edges, and bent as if broken; the feet are palmated and four-toed. The common flamingo (*P. antiquorum*) occurs abundantly in various parts of Southern Europe, Northern Africa, etc. It



Flamingo, with Female on nest.

is entirely scarlet, except the quill feathers, which are jet-black. The tongue is fleshy, and one of the extravagances of the Romans during the later period of the empire was to have dishes composed solely of flamingoes' tongues. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt-marshes. They are extremely shy and watchful. While feeding they keep together, drawn up artificially in lines, which at a distance resemble those of an army; and, like many other gregarious birds, they employ some to act as sentinels, for the security of the rest. Their food appears to be mollusca, spawn, crustaceans, etc., which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the crook in their beak. They breed in companies in inundated marshes, raising the nest to a certain height by heaping up the mud with their feet into a small hillock, which is concave at the top. In this the female lays her eggs, and it was formerly believed that she sat on them with her legs hanging down, like those of a man on horseback. But the nests are not so high as to allow of this, and the birds really sit with their legs doubled up under them. An American species of flamingo is *P. ruber*.

Flaminian Way (flam-in'i-an), the principal northern road which led from ancient Rome. It was constructed by C. Flaminius the Elder in 220 B.C. during his censorship, and led from Rome to Ariminum (Rimini) on the Adriatic, 222 miles. Remains of it are yet extant in various places.

Flamininus (flam-in-i'nus), Titus Quintius, a Roman general, born about 230 B.C.; died about 174. He was quæstor in 199, consul in 198, terminated the Macedonian war by the defeat of Philip at Cynoscephalæ 197, and proclaimed at the Isthmian games in 196 the independence of Greece.

Flaminius (flâ-min'i-us), Caius, a Roman general, was tribune in 232 B.C., prætor in 227, consul in 223, censor in 220, and again consul in 217. He had a triumph for defeating the Insubrian Gauls; and during his second consulship he constructed the Flaminian Way and built a circus. In 217 he was sent against Hannibal into Etruria, and was defeated and killed in the battle of Lake Thrasymenus (23d June).

Flammarion (flâ-mâ-re-ôn), Camille, author, born at Montigny-le-Roi, France, in 1842. He studied divinity, was a pupil at the Astronomical Observatory of Paris, 1858-62, and formed the Astronomical Society of France in 1887. His works are popular in character. They include *The Atmosphere*, *The Planet Mars*, *Popular Astronomy*, *Lumus*, etc. He became an earnest investigator of spiritualism and wrote several works favoring that subject.

Flamsteed (flam'stēd), John, the first astronomer-royal of England, was born in 1646. He was graduated at Cambridge in 1674, took orders in the church, but devoted himself chiefly to mathematical and astronomical pursuits. He was appointed by Charles II astronomical observator to

the king, and carried on his observations at the Queen's House at Greenwich, until the observatory was built for him in 1676. Here he passed his life; formed the first trustworthy catalogue of fixed stars; and supplied the lunar observations by means of which Newton verified his lunar theory. He died in 1719. His great work, *Historia Cœlestis*, was published in 1725. In 1832 the discovery of a collection of his letters disclosed a protracted quarrel between him and Newton.

Flanders (flan'ders), a region of Europe, now included in Holland, Belgium, and France, stretching along the German Ocean. The erection of the territory into a county took place in the 9th century, and was made by Philip the Bold, king of France, in favor of his son-in-law, Baldwin. It afterwards passed to the united houses of Spain and Austria, and ultimately to the latter, but underwent considerable curtailment by the conquests of the French in the west, when part of it became French Flanders, and by the conquests of the Dutch in the north. The remainder still retains its ancient name, and forms the modern provinces of East and West Flanders, in Belgium.—The Belgian province of EAST FLANDERS (French *Flandre Orientale*) has an area of 1157 square miles. The surface forms an extensive plain, sloping gently eastwards. It wholly belongs to the basin of the Schelde. Its soil, partly of a sandy and partly of a clayey nature, is so industriously and skillfully cultivated that it has the appearance of a vast garden. The principal crops are wheat and flax. Linen, laces, and damask are among the important manufactures. Gand or Ghent is the capital.—WEST FLANDERS (French, *Flandre Occidentale*) has an area of 1248 square miles. The surface is generally flat; the soil naturally sandy and poor, but well cultivated and fertilized, though not so productive as that of East Flanders. The most important branch of industry is linen. Great quantities of lace also are made. Bruges is the capital.

Flange (flanj), a projecting edge, rim, or rib on any object, as the rims by which cast-iron pipes are connected together, or the projecting pieces on the tires of the wheels of railway-carriages to keep them on the rails.

Flank, in fortification, that part of a work which affords a lateral defense to another. In military tactics flank signifies the outer extremity of the wing of an army, or of any division of an army, as of a brigade, regiment, or battalion.

Flannel (flan'el), a woolen fabric of loose texture and various degrees of fineness, much used as a clothing both in hot and cold countries from its properties of promoting insensible perspiration, which is absorbed and carried off by the atmosphere. Welsh flannels have attained a high reputation. In flannel shirtings the wool is frequently mixed with silk, linen, and cotton.

Flat, a character or sign in music, used to lower or depress, by the degree of a semitone, any note in the natural scale. It is marked thus ♭. An *accidental flat* is one which does not occur in the signature, and which affects only the bar in which it is placed.

Flat-fish, a fish which has its body of a flattened form, swims on the side, and has both eyes on the side which is uppermost in swimming, as the flounder, turbot, halibut, and sole. The word is sometimes extended to other fishes which have the body much compressed, as the skate and other members of the ray family.

Flathead Indians, tribes established in the State of Washington, mainly of the now nearly extinct Chinook group of fish-eating Indians. They flatten the skull of the infant by some mechanical pressure during the first six or eight months of life. The same custom anciently prevailed among many tribes, but the practice is now nearly extinct. The name Flathead is improperly given to the small civilized tribe of Selish Indians.

Flat River, a city in St. François County, Missouri. In a lead-mining section. Pop. 5112.

Flaubert (flō-bār), GUSTAVE, novelist, born at Rouen, France, in 1821; died in 1880. His first (unsuccessful) writings were poems, but his *Madame de Bovary*, a realistic novel, had wonderful success. Other works were *Salammbo*, *Trois Contes*, etc. He was a deliberate stylist, believing that the greatest writer was he who became the most perfect instrument for receiving impressions from external things and rendering them in accurate language.

Flavel (flav'el), JOHN, nonconformist divine, born in Worcestershire, England, in 1627; died at Exeter, 1691. He was curate at Deptford and Dartmouth, but was ejected under the Act of Uniformity, when he continued to preach privately.

Flavine (flav'ēn; Lat. *flavus*, yellow), a yellow dye-stuff identical with quercitrin, and used as a substitute for quercitron bark. It gives a fine olive yellow color to cloth.

Flax (flaks), the common name of the plants of the genus *Linum*, nat. order Linaceæ. The species, of which there are nearly a hundred, are herbs or small shrubs, with narrow leaves, and yellow, blue, or even white flowers arranged in variously-formed cymes. They occur in warm and temperate regions over the world. The cultivated species is *L. usitatissimum*. The

Flax (*Linum usitatissimum*).

fiber, which is used for making thread and cloth called linen, cambric, lawn, lace, etc., consists of the woody bundles of the slender stalks. The fine fibers may be so separated as to be spun into threads as fine as silk. A most useful oil is expressed from the seeds, and the residue, called linseed-cake, is one of the most fattening kinds of food for cattle. When the plant is ripe it is pulled up by the roots, tied in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth or by passing the stems through an iron comb. The process of removing the seeds is called *rippling*. The stalks are then *retted* or rotted in water to free the flaxed fiber from the wooden core or *boon* of the stem. Two operations are necessary to separate the fibers from the woody part of the stem. The flax is first *broken* by means of a wooden handle and grooved board, or by revolving grooved rollers, and then the *boon* or woody part is entirely separated from the fiber by a broad, flat, wooden blade called a *scutching blade*, or by a machine in which a number of knives attached to the arms of a vertical wheel strike the flax in the direction of its length, and completely separate it. The flax is next *heckled*, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning. See *Linen*.

In the United States and Canada considerable quantities of flax are grown, mostly for the seed, experiments in utilising the fiber proving unsatisfactory. In 1918 the flaxseed production in the United States was 15,600,000 bushels. The price per bushel in 1916 was $2.347; in 1917 it had risen to $3.085, and in 1918 there was a further increase to $3.309 per bushel. In Canada, according to the Dominion census returns, the area devoted to flax in 1918 was 921,826 acres, as compared with 919,500 acres in 1917. The crop production in 1917 was 5,944,000 bushels; in 1918 it was 7,695,000 bushels. The average yield of flaxseed in Canada is 12 bushels per acre. In Ontario flax is grown for both seed and fiber. In the prairie provinces flax is practically grown for seed only, and is purchased by the linseed oil mills in Canada and the United States. (See *Linseed Oil*.) During the war, 1914-18, the Allies depended solely upon the flax grown in Ireland for producing the aeroplane cloth essential for the wing coverings of aeroplanes. Belgian or Courtrai flax is the finest in quality; Irish comes next; then the Dutch; Russia supplying all the coarser fiber.

Flax, New Zealand, a fiber obtained from a plant belonging to the order Liliaceæ, the *Phormium tenax*. It is indigenous in New Zealand and Norfolk Island, and grows in great tufts with sword-shaped leaves sometimes 6 feet long. The long spike, bearing a large number of yellow flowers, rises from the center of the leaves. The thick, leathery leaves contain a large quantity of good strong fiber, which is used by the natives of New Zealand for making cloth, nets, etc., and would be very valuable in commerce but for the gummy matter in the leaves which it is difficult to get rid of. It has been introduced into European culture.

Flaxman (flaks'man), John, one of the most distinguished English sculptors, born at York, 1755; died in London, 1826. His earliest notions of art were derived from casts in the shop of his father, who sold plaster figures, from many of which young Flaxman made clay models. In 1787 he went to Italy, where he remained seven years, and left many memorials of his genius, besides executing designs in outline to illustrate Homer, Dante, and Æschylus, an extensive series for each. In 1794 he returned to England, where he was diligently occupied with his professional pursuits until his death. He had been elected an associate of the Royal Academy in 1797, royal academician in 1800, and in 1810 was appointed professor of sculpture to that institution. His works

are very numerous, and are to be found all over the country; and a large collection of casts from the original models, etc., is preserved in University College, London.

Flea (flē), a name for several insects regarded by etomologists as constituting a distinct order Aphaniptera,

A, Flea (*Pulex Irritans*). B, Larva of same. C, Pupa of same.

because the wings are inconspicuous scales. All the species of the genus are very similar to the common flea (*Pulex irritans*). It has two eyes and six feet; the feelers are like threads; the oral appendages are modified into piercing stilets and a suctional proboscis. The flea is remarkable for its agility, leaping to a surprising distance, and its bite is very troublesome.

Fleabane (flē'bān), a name popularly given to several composite plants from their supposed power of destroying or driving away fleas, as the species of the genus *Conyza*, which were believed to have this power when suspended in a room. The common fleabane is *Pulicaria dysenterica*, found in moist, sandy places in the south of England, whose smoke was supposed to expel fleas. The blue fleabane is *Erigeron acre*, common on dry banks.

Flea-beetle, the name given to different species of beetles which are destructive to plants. The turnip-flea (*Haltica nemŏrum*), whose larvæ are sometimes so destructive to the turnip crops, furnishes an example.

Flèche (flāsh), La, a town in France, department of Sarthe, on the right bank of the Loir, 25 miles southwest of Le Mans. It contains a military college, occupying part of the extensive buildings of a former college belonging to the Jesuits. Pop. of commune 10,519.

Flecknoe (flek'nō), Richard, an English poet and dramatic writer, said to have been a Roman Catholic priest, contemporary with Dryden, and chiefly memorable for having had his name gibbeted by that satirist in the title of his satire against Shadwell. He died in 1678.

Fleece, Golden. See *Argonauts* and *Jason*.

Fleece, Order of the Golden. See *Golden Fleece*.

Fleet (flēt), a general name given collectively to the ships of a navy; also any number of ships, whether designed for war or commerce, keeping in company.

Fleet Marriages, irregular marriages performed without license by needy clergymen in the Fleet Prison, London, from about 1616 till they were suppressed by the Marriage Act of 1754. These clergymen were ready to marry any couples that came before them for a fee proportioned in amount to the circumstances of those who were married. Sometimes a dram of gin was thought sufficient; at other times the fee was rather exorbitant. Registers of these marriages were kept by the officiating parties, and a collection of these books, purchased by government in 1821, amounted to between 200 and 300 large registers, and upwards of 1000 smaller books. These books were inadmissible as evidence in a court of justice.

Fleet Prison, formerly a celebrated prison in London, till it was pulled down in 1845. It stood on the east side of Farringdon Street, and on this site a prison was in existence as early as the 12th century, which took its name from the creek or stream of the Fleet, on the bank of which it was erected. It was early used as a place of confinement for debtors, and served as such down to the period of its abolition. It was burned by Wat Tyler in 1381, in the Great Fire of 1666, and by the Gordon rioters in 1780. It was the scene of many disgraceful abuses, and was called by Pope the 'Haunt of the Muses,' from the number of poets who were confined in it.

Fleetwood (flēt-wud), a seaport and watering-place in England, in the county of Lancaster, on the Wyre, near its entrance into Lancaster Bay, 18 miles northwest of Preston. It has a school of musketry and barracks. The harbor is safe and commodious. Pop. (1911) 15,876.

Fleming (flem'ing), John, a Scottish naturalist, born near Linlithgow, in 1785; died at Edinburgh, 1857. He was successively minister of the parish of Bressay, in Shetland; professor of natural philosophy at King's College, Aberdeen, and professor of natural science at the New College, Edinburgh. He wrote a *Report on the Economical Mineralogy of the Orkney*

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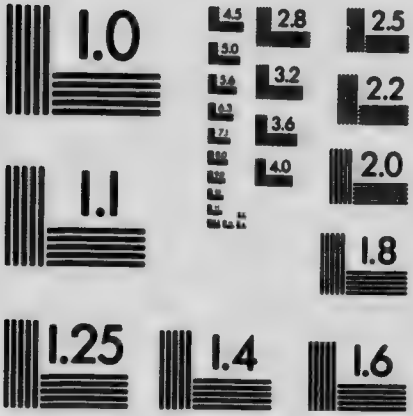

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and Zetland Islands; the *Philosophy of Zoology; British Animals;* and a large number of papers on zoology, palæontology, and geology contributed to the *Encyclopædia Britannica*, the *Edinburgh Encyclopædia*, the *North British Review*, etc.

Flemish Language and Literature. The Flemish or Vlaemisch language is a form of Low German, differing only slightly in pronunciation and orthography from the Dutch. It is spoken by a considerable number of the inhabitants of Belgium, especially in the provinces of East Flanders, West Flanders, Antwerp, Limburg, and Brabant. A fragment of a prose translation of the Psalms upwards of a thousand years old is the oldest extant specimen of the Flemish. The 'father of Flemish poetry,' Jakob Van Maerlant, wrote several romances dealing with Merlin and the Holy Grail, *The Mirror of History*, etc., in the 13th century; and a version of *Reynard the Fox* belongs to the same period. The 14th century was remarkable for the number of wandering poets, authors of knightly romances. The translation of the Bible, which is considered the standard for the construction and orthography of the language, was finished in 1618. The eighteenth century produced several good writers on philology, but was barren in poetry. The French almost annihilated the native literature, and it did not revive till the revolution of 1830, since which time it has been very vigorous. The leaders in this revival were Willems, Blommaert, Van Ryswyck, Conscience, Van Duyse, Snellaert, Snieders, De Laet, Dedecker, David, and Bormans.

Flemish School OF PAINTING. See *Painting.*

Flensburg (flens'burg), formerly *Flensborg*, a town in Prussia, province of Schleswig-Holstein, at the west end of the fiord of same name, 20 miles N. N. E. of the town of Schleswig. It has important manufactures and is the seat of an active trade, being the most important town in Schleswig. Pop. (1910) 60,922.

Flers (flâr), a town in France, dep. Orne, 37 miles northwest of Alençon. It contains the remains of a fine old castle, has manufactures of linen, bleach-works, etc. Pop. (1906) 11,188.

Flesh, a compound substance forming a large part of an animal, consisting mainly of the muscles, with connective tissue, and the blood-vessels and nerves, etc., supplying them. It consists chiefly of fibrin, with albumen, gelatin, hæmatin, fat, phosphate of sodium, phosphate of potassium, phosphate and carbonate of calcium, sulphate of potassium, and chloride of sodium. The solid part is, besides, permeated by an alkaline fluid, called serum. It has a red color, and contains dissolved a number both of organic and inorganic substances. The organic matter consists of albumen, casein, creatin and creatinin, inosic and several other acids; the inorganic, of alkaline sulphates, chlorides, and phosphates, wth lime, iron, and magnesia.

Fleshfly. See *Blowfly.*

Fleta (flē'ta), a Latin commentary upon English law, said to have been written in the Fleet Prison in the reign of Edward I. It has been attributed to William de Brampton, and also to Thomas de Weyland, J. de Lovetot, and Adam de Strutton.

Fletcher (flech'er), ANDREW, a Scottish political writer, the son of Sir Robert Fletcher, of Saltoun, born in 1653; died at London in 1716. He opposed the court in the Scottish Parliament, and had to retire to Holland. In 1685 he joined the enterprise of the Duke of Monmouth. He afterwards took refuge in Spain and in Hungary, and returned to England at the Revolution. He brought forward measures to secure the religion and liberties of the nation on the death of the queen (Anne), and carried various limitations of the prerogative, forming part of the Act of Security, rendered nugatory by the Scottish union, which he vehemently opposed.

Fletcher, FRANK FRIDAY, admiral of the United States Navy, born at Oskaloosa, Iowa, in 1855, graduated from the Naval Academy in 1875 and was promoted through various grades to rank of admiral in 1915. He was in command of the naval forces which took possession of Vera Cruz in April, 1914, and succeeded Rear-Admiral Badger as commander-in-chief of the North Atlantic Fleet the same year. He was the inventor of the Fletcher breech mechanism and gun mounts.

Fletcher, JOHN, English dramatist, collaborator with Francis Beaumont. See *Beaumont* and *Fletcher.*

Fleur-de-lis (fleur-dē-lē'; French, 'flower of the lily'), in heraldry, a bearing as to the origin of which there is much dispute, some authorities maintaining that it represents the lily, others that it represents the head of a lance or some such warlike weapon. The fleur-de-lis has

Fleur-de-lis.

long been the distinctive bearing of the government of France.

Fleurus (fleu-rüs), a town of Belgium, province of Hainaut, 7 miles northeast of Charleroi. In the vicinity, in 1690, the French under Marshal Luxembourg defeated the Germans under Prince Waldeck; and in 1794 the French republican forces under Marshal Jourdan defeated the Austrian army. Pop. about 6000.

Fleury (fleu-rē), ANDRÉ HERCULE DE, cardinal and prime-minister of Louis XV, was born in 1653; died in 1743. In 1698 Louis XIV gave him the bishopric of Fréjus, and shortly before his death appointed him instructor to Louis XV. After the death of the regent in 1723 he proposed the Duc de Bourbon as first minister, but in 1726 he overturned the government which he had himself set up, and from that date kept the direction of affairs in his own hands. In the same year he was made a cardinal. The internal affairs of France prospered under his administration, but his foreign policy was unfortunate.

Fleury, CLAUDE, a French writer, born in 1640; died in 1723. He was educated in the Jesuit College at Clermont, and after beginning to practise as a lawyer resolved to take orders. In 1716 he became confessor to Louis XV. He procured admission into the Academy in 1696 by several important works, among which the best known are his *Histoire du Droit Français, Mœurs des Israélites, Mœurs des Chrétiens, Institution au Droit Ecclésiastique, Histoire Ecclésiastique.*

Flexner, SIMON, American physician, director of laboratories, Rockefeller Institute for Medical Research, was born at Louisville, Ky., 1863, and educated at the universities of Louisville, Strassburg, Prag, and Berlin. He was associate professor of pathology in Johns Hopkins University, 1891-98; professor of pathological anatomy, 1898-99; professor of pathology, University of Pennsylvania, 1899-1903; director Ayer Clinical Laboratory, Pennsylvania Hospital, 1901-03; and Philadelphia Hospital, 1890-1903. He has written many books relating to bacteriological and pathological subjects.

Flinders (flin'derz), MATTHEW, an English navigator, celebrated for his Australian discoveries, born in Lincolnshire 1774; died 1814. He went to Australia in 1795, and discovered Bass Strait in 1798. In 1801 he obtained from the British government the command of an expedition to explore the Australian coasts, in which he spent two years. While returning home he was taken prisoner by the French at Mauritius, and detained till 1810, after which he published his *Voyage to Terra Australis. Flinders Island* (off the N. E. coast of Tasmania) was named after him.

Flint, or FLINTSHIRE, a maritime county in North Wales, area 255 sq. miles, of which three-fourths is under crops or in pasture. The county is rich in minerals, particularly lead, the mines of which are productive. Coal also abounds, and copper is obtained in considerable quantities. Flint returns one member to the House of Commons. Capital, Mold. Pop. 92,720.—The former capital, FLINT, a parliamentary and municipal borough and seaport, is situated on the estuary of the Dee, 13 miles S. W. of Liverpool. In the vicinity are extensive alkali works and several lead and coal mines. There are also large copper works. The shipping trade of the port is small. A little N. E. of the town, on the shore of the estuary, stands the ancient castle of Flint, commenced by Henry II and completed by Edward I. It was the prison of Richard II, and has remained in ruins since 1667. Pop. (1911) 5474.

Flint, a city, county seat of Genesee Co., Michigan, is on the Flint River, 34 miles S. E. of East Saginaw. It has a state institution for the deaf and dumb, an insane asylum, and manufactures of automobiles and automobile parts, carriages, cigars, iron goods, etc. Pop. 42,000.

Flint, a variety of quartz of a yellowish or bluish-gray or grayish-black color. It is amorphous, and usually occurs in nodules or rounded lumps. Its surface is generally uneven, and covered with a whitish rind or crust, the result of weathering or of the action of water percolating through the rocks. It is very hard, strikes fire with steel, and is an ingredient in glass and in all fine pottery ware. The fracture of flint is perfectly conchoidal; though very hard, it breaks easily in every direction, and affords very sharp-edged, splintery fragments, formerly made into arrow-heads, etc. (See *Flint Implements.*) Its true native place is the upper bed of the chalk formation, in which it is formed as a series of concretions, the silica in sponges and in other marine animals which lived on the sea floor while the chalk was being deposited being attracted into nodules in this process.

Flint-glass, a species of glass, so called because pulverized flints were originally employed in its

manufacture. It is extensively used for domestic purposes. Its dispersive power in regard to light renders it invaluable in the manufacture of the object-glasses of telescopes and microscopes, as by combining a concave lens of flint-glass with one or two convex lenses of crown-glass, which possesses a much less dispersive power, a compound lens is formed in which the prismatic colors arising from simple refraction are destroyed, and the lens rendered achromatic. Quartz and fine sand are now substituted for flint in the manufacture of this glass.

Flint Implements, implements of flint used by man while unacquainted with the use of metals. For such implements granite, jade, serpentine, jasper, basalt, and other hard stones were also used, but the most numerous were formed of flint. They consist of arrow-heads, axe-heads, lance-heads, knives, wedges, etc. (See *Celts.*) Flint implements are still used by some savage tribes.

Flintlock, a musket-lock in which fire is produced by a flint striking on the steel pan, formerly in common use, now superseded by locks formed on the percussion principle.

Floating Batteries (flōt'ing), batteries erected either on simple rafts or on the hulls of ships, for the defense of a coast or for the bombardment of an enemy's ports. They were used notably at the siege of Gibraltar (1779-83) and during the Russian war (1854).

Floating Breakwater. See *Breakwater.*

Floating Docks. See *Docks.*

Floating Island, an island formed in a lake or other inland water, consisting generally of a mass of earth held together by interlacing roots. They occur on the Mississippi and other rivers, being portions of the banks detached by the force of the current and carried down the stream, often bearing trees. Sometimes such islands are large enough to serve as pasture grounds. Artificial floating islands have been formed by placing lake mud on rafts of wickerwork covered with reeds. They were formerly used in the waters around Mexico, and may be seen in Persia, India, and on the borders of Tibet. On these the natives raise melons, cucumbers, and other vegetables which need much water.

Floating Quartz, or FLOATSTONE, a porous variety of quartz of a spongy texture, whitish-gray in color, so light as to float in water. It frequently contains a nucleus of common flint.

Flobecq (flō-bek), a town of Belgium, prov. of Hainaut, 20 miles N. E. of Tournai. Pop. 5200.

Flock (flok), the refuse of cotton and wool, or the shearing of woolen goods, etc., used for stuffing mattresses, furniture, etc. *Flock-paper* is a kind of wall-paper, having raised figures resembling cloth, made of flock, or of cloth cut up very fine, and attached to the paper by size or varnish.

Flodden (flod'en), a village of England, in Northumberland, about 5 miles S. E. of Coldstream. Near it was fought the celebrated battle in which James IV of Scotland was defeated by the Earl of Surrey (Sept. 9, 1513).

Flogging (flog'ing), the infliction of stripes or blows with a whip, lash, or scourge, especially as a judicial punishment. As a punishment it has practically ceased in both the army and navy, though formerly very common. In the United States the whipping-post is maintained as part of the penal methods in the State of Delaware. The chastisement is chiefly imposed for larceny and also for wife-beating. The punishment of the knout in Russia and of the bastinado in the East are severe forms of this punishment.

Flood (flud), HENRY, an Irish orator and politician, born near Kilkenny in 1732; died in 1791. He entered the Irish Parliament in 1759, was privy-councillor for Great Britain as well as for Ireland in 1775, vice-treasurer for Ireland 1775-81. In 1783 he had a personal dispute in the house with Grattan, when a remarkable display of the power of invective was made on both sides. He afterwards became a member of the British Parliament. His speeches and some poetical pieces have been published.

Flood-plain, a plain formed by successive river overflows, extending a considerable distance on each side of a stream and made up of layers of mud, sand, and gravel deposited by the water. Some of these are very wide and usually very level in surface. Notable among such plains are those of the Mississippi, the Amazon, the Nile, and the Ganges.

Floods, or INUNDATIONS, river overflows or ocean inundations. Long-continued rains and melting snows are apt to produce them in rivers; especially the sudden and violent rains known as cloudbursts; also the breaking of reservoir dams. The ocean may cause them through the breaking of dykes or

the overflow of lowlands during severe storms or from earthquake convulsions. Striking examples of river floods are those of Johnstown, Pennsylvania, in 1889, by which several thousand people were drowned, and that of the Hoang Ho, China, in 1853, which caused a frightful loss of life. The dykes of Holland have given way on several occasions, drowning large numbers of people. A cyclone wave in Bengal in 1876 caused a flood in which 200,000 people were drowned. Unprecedented floods in the Ohio and Mississippi valleys in 1913 killed hundreds of persons and destroyed a vast amount of property.

Floor-cloth (flōr), a useful substitute for carpet, the basis of which is a strong open canvas. It is woven 6 to 8 yards wide, and in lengths of from 100 to 113 yards. A length of 60 to 100 feet of canvas is stretched in a frame, brushed with glue-size, and rubbed with pumice-stone. It then receives two or three foundation coats of paint on each side. Each coat on the front is smoothed with pumice-stone. When this operation is completed the cloth is transferred to the printing-room, where the pattern is printed in oil colors by blocks, as in calico-printing.

Floorwalker, a person employed in the large department stores to watch the behavior of employees, to give information to applicants, and to settle any disputes or difficulties that may arise.

Flora (flō'ra), the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. Her festival, the Floralia, was celebrated from April 28th to May 1st, with much licentiousness. In botany, *flora* signifies the plants of a region collectively, as *fauna* signifies the animals.

Floral Games. See *Jeux Floraux.*

Floréal (flō-rā-ăl; month of flowers), the eighth month in the calendar of the French revolution. It began April 20th, and ended May 19th.

Florence (flor'ens; Italian, *Firenze;* in old Italian and in poetry, *Fiorenza;* ancient *Florentia Tuscorum*), a celebrated city of Italy, capital of a province of same name, 143 miles northwest from Rome, and 50 miles E. N. E. from Leghorn. The city is surrounded by hills, and is beautifully situated on both banks of the Arno, but the greater part of it lies on the right bank. Six bridges connect the banks of the Arno, and on either side of the Arno is a spacious quay called the Lung' Arno, a favorite promenade. The private dwellings are mostly handsome, and the palaces, of which there are many, are noble and impressive structures. The city contains numerous piazzas or squares, the most important of which is the Piazza della Signoria, surrounded by important buildings, and adorned with a marble fountain, and a bronze statue of Cosmo I, by John of Bologna. In this piazza is situated the Palazzo Vecchio, originally the seat of the government of the republic, and subsequently the residence of Cosmo I. The most remarkable building in Florence is the Duomo, or cathedral of St. Maria del Fiore, erected 1298-1474, but its façade not completed till 1887, surmounted by the magnificent dome of Brunelleschi, and situated in a spacious square nearly in the center of the city. Near the cathedral are the campanile designed by Giotto, and the small church of St. John (San Giovanni), the Baptistery, the three bronze gates of which, with figures in high relief, are celebrated as among the most beautiful works of the kind extant. One of these is by Andrea Pisano, the two others by Ghiberti. The church of S. Croce is the burial-place of many of the most eminent Tuscans, contains much fine sculpture and many interesting tombs, amongst others those of Michael Angelo Buonarotti, Galileo, Machiavelli, and Alfieri. In the Piazza S. Croce stands Dante's monument by Pazzi, inaugurated 1865. The chief art collection is the Galleria degli Uffizi. In this gallery are contained specimens of painting and statuary by the greatest masters in these arts. In statuary, among numerous antiques may be specified the *Venus de' Medici*, the *Apollino*, the *Knife-grinder*, the *Dancing Faun*, the *Wrestlers*, and the group of *Niobe and her Children;* and in painting there are works by Michael Angelo, Raphael, Titian, Fra Angelico, Fra Bartolomeo, Andrea del Sarto, Correggio, Guido, and numerous others of the first names in various schools. Other important art collections are preserved in the various churches and palaces, one of the principal being that in the Pitti Palace. The building formerly known as the *Bargello*, erected about 1250 for the chief magistrate of the republic, and subsequently used as a prison, has recently been restored, and is now opened as a national museum, illustrative of the history of Italian culture and art in medieval and modern times. The Laurentian or Medicean Library contains upwards of 9000 ancient MSS. The Magliabecchian Library is the great repository of printed

books. The Biblioteca Marucelliana and the Biblioteca Riccardiana are also important public libraries. The charitable institutions are numerous and important. Schools and other literary and educational establishments are also numerous. The manufactures have greatly fallen off, but still embrace woolens, silk, straw hats, porcelain, mosaics, and numerous objects in the fine arts.

Florence was probably founded by the Romans in the 1st century B. C., and early attained considerable prosperity. During the dark ages it was frequently devastated, but it revived about the beginning of the 11th century, at which time the Florentines became extensive European traders. Their silk and woolen fabrics excelled, and their skill as workers in gold and jewels was unsurpassed. About this time Florence took an active part in the feud which broke out between the Guelphs and Ghibellines, the town generally supporting the former against the imperial party. In 1283 a species of republic was constituted; but about the year 1300 the party struggles again burst forth between the same rival families under the new names of the *Whites* and the *Blacks*, in which the Blacks (the Guelphs) were eventually victorious, and the Whites, among whom was the poet Dante, banished. In the course of these troubles a family of merchants named the Medicis rose to great influence in Florentine politics. One of them, Cosmo, born in 1389, was the founder of the political greatness of his house. His grandson, Lorenzo, surnamed *Il Magnifico*, as a statesman, scholar, and patron of art and literature, attained the highest celebrity. Under him Florence, which, though calling itself a republic, was in reality ruled by him, rose to a great pitch of opulence and power, and notwithstanding the hostility of the pope he exercised a great influence throughout Italy. On the fall of the republic in the 16th century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was chosen by Charles V as Duke of Florence. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterwards Emperor of Germany. From this period the history of Florence merges into that of Tuscany until its amalgamation with the Kingdom of Italy. From 1865 till 1871 it held the dignity of capital of the kingdom, the seat of government being transferred to it from Turin. Amongst the illustrious men it has produced are Dante, Petrarch, Boccaccio, Guicciardini, Lorenzo de' Medici, Galileo, Michael Angelo, Leonardo da Vinci, Benvenuto Cellini, Andrea del Sarto, Amerigo Vespucci, Machiavelli, and others. Population at last census 220,879.—The province has an area of about 2262 English square miles. The surface is beautifully diversified by mountains, valleys, and plains. The climate is generally mild and healthy, and the soil very fertile. Pop. 937,786.

Florence, Council of, along with that of Ferrara, a continuation of the Council of Basel, with sessions at intervals from 1439 to 1442. Its object was a reunion of the eastern and western churches; but the agreement was later repudiated by a council at Constantinople.

Florence, a city, capital of Florence County, South Carolina, 102 miles N. of Charleston. It has railroad shops, cotton-gins, plow, fertilizer and other factories, and a State Industrial School for Boys. Pop. 9000.

Florence, a city, capital of Lauderdale County, Alabama, at the head of deep water navigation on Tennessee River. It contains a State normal school. It is in a coal and iron region and has large manufactures. Pop. 7500.

Florentine Work (flor'en-tēn), a kind of mosaic work, consisting of precious stones and pieces of white and colored marble, which has long been produced in Florence. It is applied to jewelry, and used for table tops, etc.

Flores (flō'res), or Floris, an island of the Indian Archipelago, one of the chain which extends east from Java. It is about 230 miles long and from 15 to 35 miles wide, and has a mountainous surface, with several volcanic peaks. The natives are tall and robust frizzly-haired savages, belonging to the dark Papuan race. The island is under Dutch supremacy. Sandalwood, bees'-wax, and horses are exported. The passage between the east end of the island and those of Solor and Adenara is called Flores Strait; and the part of the Pacific north of the Flores chain and south of Celebes is called the Flores Sea.

Flo'res, the most westerly island of the Azores, about 30 miles long by 9 miles broad, with a hilly surface. The chief products are wheat, pulse, and poultry, and great numbers of small cattle are reared. Pop. about 10,000.

Floret (flō'ret), a single small flower in a compact inflorescence, as in the compound flower of the Compositæ, or in the spikelet of grasses.

Florian (flo-re-on), JEAN PIERRE CLARIS DE, a French writer, born 1755; died 1794. He was patronized by Voltaire, and gained fame as a writer of fables, pastorals, romances, and comedies. He was imprisoned during the revolution, but the fall of Robespierre saved him from the guillotine. His romances *Galatée*, *Estelle*, *Gonsalve de Cordoue*, *Numa Pompilius*, his fables, and translation of *Don Quixote* are his best works.

Florianopolis (flo-ri-an-op'ō-lis), formerly Desterro, capital of the province of Santa Catharina, Brazil, on the western shore of Santa Catharina Island. It is the chief commercial center of the state. Pop. about 15,000.

Floriculture (flo-ri-kul'tūr), the culture or cultivation of flowers or flowering plants, whether in open beds, in gardens, in conservatories or greenhouses, or in rooms in dwelling-houses.

Florida (flor'i-dâ), one of the United States, forming the southeastern extremity of the country, and having the Gulf of Mexico on the south and west, and the Atlantic on the east. It consists partly of a peninsula stretching south for about 400 miles, partly of a long, narrow strip of land running along the Gulf of Mexico to a distance of 350 miles from the Atlantic coast-line. The peninsula is about 90 miles in width, and contains about four-fifths of the total area, which is 58,666 sq. miles. The surface is in general level, rising little above the sea, especially in the southern parts. Here, however, the swamps or everglades are being drained by the state, and becoming the most valuable lands in Florida. The northern portion is more broken and elevated. The principal river is the St. John's. Its tributary, the Ocklawaha, has its course so flat that for a long distance it spreads out into the forest for half a mile or more on either side, so that nothing is seen but trees and water. The Appalachicola, Suwanee, etc., flow into the Gulf of Mexico. There are many lakes throughout the peninsula, the largest being Okeechobee (area 650 sq. miles). Numerous islands are scattered along the south and west coasts, the most remarkable of which is a group, or rather a long chain, called the Florida Keys at the southern extremity of Florida. The most important of these is Key West, containing the city and naval station of same name. The state produces tropical fruits in great perfection, especially oranges, lemons, limes, grapefruit and pineapple. The planting of orange groves has been carried on extensively in recent times, and oranges are now a specialty of Florida. Tobacco, cotton, sugar, maize, potatoes, rice, oats, etc., are among the other productions. The forests form an important source of wealth. The minerals are unimportant, with the exception of phosphates and Fuller's earth, mined in large quantities. Among the wild animals are the puma, manatee (sea cow), alligator, crocodile, bears and wild cat (lynx). Birds are extremely numerous and varied. The coasts, rivers, and lakes swarm with fish; tortoises and turtles also abound. As regards climate, Florida may be divided roughly into three zones, "southern," semi-tropical and sub-tropical. The mean annual temperature is 70.8° F., and the rainfall averages 52 inches. The state is much frequented as a winter health resort for invalids, especially St. Augustine, Ormond, Daytona, Palm Beach, Miami, Tampa, White Springs, etc. Florida, long in a backward condition, has recently made great advances in prosperity, being now well supplied with means of communication, and town and villages rapidly springing up. Tallahassee is the capital and seat of government. Jacksonville, Pensacola, Key West, and Tampa are thriving ports; St. Augustine is the oldest town in the United States. Proposals have been made to construct a ship-canal through Florida as a short route from the Atlantic to the Gulf of Mexico. Florida was first explored in 1512 and 1516 by Ponce de Leon, a Spanish adventurer. It was ceded to Great Britain by Spain in 1763 in exchange for Cuba, reacquired by the Spaniards in 1781, and confirmed to them at the peace of 1783. It was ceded to the United States in 1821, and organized as a territory in 1822. A long series of conflicts with the Seminole Indians retarded its prosperity. In 1845 it was admitted into the Union. In 1861 it seceded from the Union, to which it was not readmitted till 1868, when it adopted a new constitution. Pop. (1910) 752,619

Florida, GULF OF, the narrow sea between Florida, Cuba, and the Bahama Islands.

Florida Keys. See *Florida*.

Florideæ (flor'id-e-ē), a name given to the rose-spored algæ, now more generally known as rhodosperms.

Florid Gothic, that highly-enriched variety of Gothic architecture which prevailed in England in the fifteenth and at the beginning of the sixteenth century; often called the *Tudor style*, as it prevailed chiefly during the Tudor era.

Florin (flor'in), a name given to different coins of gold or silver of different values, and to moneys of account, in different countries. The English florin is 2*s.* or one-tenth of a pound sterling; the Austrian *gulden* or florin and the *guilder* or florin of Holland are each 1*s.* 8*d.* A gold florin value 6*s.*, was used in England in the reign of Edward III.

Florinians (flor'in-i-ans), a sect of Gnostics of the second century, so called from *Florinus*, a Roman priest who was excommunicated by Pope Eleutherius in 176.

Florio (flor'i-ō), JOHN, lexicographer and translator, born in London of Italian parents in 1545; died 1625. He taught French and Italian in Oxford University. He was appointed by James I teacher of languages to the queen and Prince Henry. His chief works are his *Italian and English Dictionary*, the *World of Words*, and his translation of Montaigne. Shakespere is said to have ridiculed him in the character of Holofernes in *Love's Labor's Lost*.

Floris (flo'ris), FRANS, a Flemish painter, whose family name was Vriendt, born at Antwerp in 1520; died there 1570. At Antwerp he established a school for painters, which produced many eminent artists. His chief works are: *The Fall of the Rebel Angels*, in the Louvre; *The Last Judgment*, in the church of Nôtre Dame, Brussels, and *The Assumption*, in Antwerp Cathedral. Other works are to be met with in Flanders, Holland, Spain, Paris, Vienna, and Dresden.

Florus (flo'rus), LUCIUS ANNÆUS, a Roman historian, was probably a native of Spain or Gaul. He is variously styled in the MSS.: in some *L. Annæus Florus*, in others *L. Julius Florus*, in others *L. Annæus Seneca*, and in one simply *L. Annæus*. He lived in the beginning of the second century after Christ, and wrote an epitome of Roman history in four books, from the foundation of the city to the first time of closing the temple of Janus, in the reign of Augustus.

Floss-silk, the portions of raveled silk broken off in reeling the silk from the cocoons, carded and spun into a soft coarse yarn, and used for common fabrics, embroidery, etc.

Flotow (flō'tō), FRIEDRICH ADOLPHUS VON, a German musical composer, born 1812; died 1883. He studied music in Paris, but his earlier operas did not find favor with the Parisian opera-house directors, so he had to content himself with performances in the aristocratic private theaters. At length the *Naufrage de la Méduse* was successfully produced at the Théâtre Renaissance in 1839. This was followed by *L'Esclave de Camoëns* (1843), and *L'Ame en Peine* (1846), performed in London as *Leoline*. *Alessandro Stradella* was first performed at Hamburg in 1844, and his most successful work, *Martha*, at Vienna in 1847. He wrote later plays and was director of the court theater at Schwerin from 1855 to 1863. The last years of his life were chiefly spent at Vienna.

Flotsam, JETSAM, AND LIGAN, in law. *Flotsam*, or *flotsam*, is derelict or shipwrecked goods floating on the sea; *jetsam*, goods thrown overboard which sink and remain under water; and *ligan*, goods sunk with a wreck or attached to a buoy, as a mark of ownership. When found, such goods may be returned to the owner if he appear; if not, they are the property of the finder.

Flounder (floun'der), one of the flat-fishes, family Pleuronectidæ, genus *Pleuronectes* or *Platessa*, the common flounder being the *Pleuronectes* or *Platessa flesus*. It is one of the most common of the flat-fishes, and is found along the shores of almost all countries. The body is extremely flattened at the sides. Flounders have been successfully transferred to fresh-water ponds. They feed upon crustacea, worms, and small fishes, and are much used as food. The Argus flounder is the *P. argus*, and is a native of the American seas.

Flour, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by sifting. The quality of flour depends principally on the fineness of the sieves through which it is passed and the amount of bran which it contains. The finest flour is obtained in the first grinding of the wheat. The other kinds—biscuit flour, middlings, seconds, etc.—consist of the flour which remains after the first grinding, ground and passed through coarser sieves.

Flourens (flō-răn), GUSTAVE, a French socialist, born at Paris 1838; died 1871. In 1863 he was deputy professor in the College of France, and published his lectures under the title of *Histoire de l'Homme*. After being engaged in democratic movements in Turkey and Italy he joined the Paris Commune in 1871, and was killed in a conflict at Rueil, near Malmaison.

Flourens, MARIE JEAN PIERRE, a French physician and physiologist, born in 1794; died in 1867. In 1828 he was elected a member of the Academy of Sciences, in 1832 was appointed to the chair of comparative anatomy at the Jardin des Plantes, Paris. In 1833 he became permanent secretary to the Academy of Sciences, in 1840 member of the French Academy. In 1846 he was created by Louis Philippe a peer of France. His works include *Expériences sur le Système Nerveux, Developpement des Os, Anatomie de la Peau, Mémoires d'Anatomie et de Physiologie Comparées, De l'Instinct et de l'Intelligence des Animaux,* and *De la Vie et de l'Intelligence* (1858).

Flower (flou'er), in popular language, the blossom of a plant, consisting chiefly of delicate and gaily-colored leaves or petals; in botany, the organs of reproduction in a phenogamous plant. A complete flower consists of *stamens* and *pistils*, together with two sets of leaves which surround and protect them, the *calyx* and *corolla*. The stamens and pistils are the essential organs of the flower. They occupy two circles or rows, the one within the other, the stamens being in the outer row. The stamens consist of a stalk or *filament* supporting a roundish body, the *anther*, which is filled with a powdery substance called the *pollen*. The pistil consists of a closed cell or *ovary* at the base, containing *ovules*, and covered by a *style* which terminates in the *stigma*. These organs are surrounded by the corolla and calyx, which together are called the *floral envelope*, or when they both display rich coloring the *perianth*. The leaves of the corolla are called *petals*, and those of the calyx *sepals*. Some flowers want the floral envelope, and are called *achlamydeous;* others have the calyx but are without the corolla, and are called *monochlamydeous*. Flowers are generally *bisexual*, but some plants have *unisexual* flowers; that is, the pistils are in one flower and the stamens in another. See also *Botany*. The figure shows the flower of *Cheiranthus Cheiri* (common wallflower); *a*, peduncle; *b*, calyx; *c*, corolla; *d*, stamens; *e*, pistil.

Parts of Flower.

Flower, BENJAMIN ORANGE, author and publisher, was born at Albion, Illinois, in 1858. He edited the *American Sentinel* till 1888, subsequently founded and edited the *Arena*, and later *The Coming Age*. He wrote *Civilisation's Inferno; Persons, Places, and Ideas*, etc. Died Dec. 24, 1918.

Flower, SIR WILLIAM HENRY, zoologist, born at Stratford-on-Avon in 1831. After filling several posts, he became in 1884 natural history director at the British Museum and was knighted in 1892. His works, which are highly esteemed, include *Introduction to the Study of Mammals, The Horse, Essays on Museums*, etc. Died 1899.

Flower-de-lis. See *Fleur-de-lis*.

Flowering Fern, the popular name of *Osmunda regalis*, nat. order Osmundaceæ. It is one of the noblest and most striking of our ferns, and grows in boggy places and wet margins of woods. It derives its name from the upper pinnæ of the fronds being transformed into a handsome panicle covered with sporangia.

Flowering Rush (*Butŏmus umbellātus*), nat. order Butomaceæ, a beautiful plant found in pools and wet ditches of England and Ireland, but rare in Scotland. The leaves are 2 to 3 feet long, linear, triangular, their sharp edges sometimes cutting the mouths of cattle, whence their generic name *Butŏmus* (ox-cutting). The scape or flowering stem terminates in a large umbel of rose-colored flowers.

Flowers, formerly a chemical name for fine particles of bodies in the form of a powder or mealy substance, as the *flowers of sulphur*, etc.

Flowers, ARTIFICIAL, imitations of real flowers, made of various materials. These are not a modern invention. The Romans excelled in the art of imitating flowers in wax, and in this branch of the art attained a high degree of perfection. The Egyptian artificial flowers were made of thin plates of horn stained in different colors, sometimes also of leaves of copper gilt or silvered over. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture, but they are now far surpassed by English and French manufacturers, more especially by the latter. Among materials used in this manufacture are cambric, muslin, satin, velvet, and other woven fabrics, feathers, India rubber, blown glass, mother of pearl, brass, etc.

Floyd (floid), JOHN BUCHANAN, politician and soldier, born at Blacksburg, Virginia, in 1807; died 1863. He was Governor of Virginia in 1850-53, and in 1859 was appointed Secretary of

War. When war became probable between the North and South he sent munitions of war southward and at the close of 1860 went to Virginia, where he became a brigadier general in the Confederate army. He lacked military ability, was easily beaten by Gen. Rosecrans in West Virginia, and when in command at Fort Donelson stole away in the night, leaving to a subordinate officer the ignominy of surrendering the fort. He was censured for this act by the Confederate government.

Fluid (flö'id), a body whose particles on the slightest pressure move and change their relative position without separation; a liquid or a gas, as opposed to a *solid*. Fluids are divided into *liquids*, such as water and bodies in the form of water; and *gaseous bodies* or aeriform fluids. Liquids have been also termed *non-elastic fluids*, for although they are not altogether void of elasticity, they possess it only in a small degree. Air and aeriform bodies have been called *elastic fluids* on account of their great elasticity.

Flukes (flöks), or FLUKE-WORMS, a name given to certain parasitic Scolecida (tapeworms, etc.), belonging to the division of Platyelmia or Flat-worms, and included in the order Trematoda. They inhabit various situations in different animals—mostly in birds and fishes. The *Distŏma hepaticum* exists in large numbers in the livers of sheep, and causes the disease known as 'rot.' Like the tapeworms, the flukes pass through an elaborate development.

Fluohydric Acid (flö-ō'hī-drik), same as *Hydrofluoric acid*.

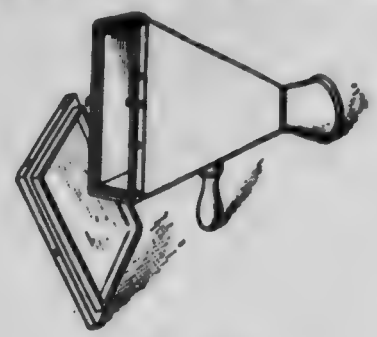
Fluorescence (flö-u-res'ens), a name given to the phenomena presented by the invisible chemical rays of the blue end of the solar spectrum when they become luminous and visible by being sent through uranium glass, or solutions of quinine, horse-chestnut bark, or *Datūra stramonium*. In this way green crystals, as of fluorspar, may give out blue rays, due not to the color of the surface of the body, but to its power of modifying the rays incident on it. The phenomenon appears to be identical with *phosphorescence*. It is due to the refrangibility of the rays being lowered or degraded by the action of the substance. The term fluorescence is applied to the phenomenon if it is observed while the body is actually exposed to the source of light; *phosphorescence* to the effect of the same kind, but usually less intense, which is observed after the light from the source is cut off. Both forms of the phenomena occur in a strongly-marked degree in the same bodies. Canary-glass, which is colored with oxide of uranium, is a very convenient material for the exhibition of fluorescence. A thick piece of it held in the violet or ultra-violet portion of the solar spectrum is filled to the depth of from ⅛ to ¼ of an inch with a faint, nebulous light. If the solar spectrum be thrown upon a screen freshly washed with sulphate of quinine, the ultra-violet portion will be visible by fluorescence; and if the spectrum be very pure, the presence of dark lines in this portion will be detected. For a similar phenomenon, presented by the ultra-red rays of the spectrum, see *Calorescence*.

Fluoride (flö'u-rīd), in chemistry, a compound obtained by heating hydrofluoric acid with certain metals, by the action of that acid on metallic oxides or carbonates, by heating electro-negative metals, as antimony, with fluoride of lead or fluoride of mercury, and in other ways.

Fluorine (flö'u-rin) is a colorless, acrid, non-combustible, tasteless, extremely irritating and penetrating, irrespirable, and very active gas. It was first isolated by De Moissan in 1886. Its name is derived from its principal natural compound, fluorspar (which see). Fluorine occurs very sparingly in the free state, but is very abundant in compounds, such as fluorspar, which is present almost everywhere; cryolite, which is a porous rock quite abundant in Greenland, and in sea and mineral waters, bones, teeth, and milk. It is the most active element and is the greatest supporter of combustion, uniting with hydrogen, sulphur, phosphorus, carbon, and many of the metals in the dark. Even the noble metals are attacked by the pure gas. Platinum, gutta-percha, ceresine (a hydrocarbon wax), and lead are able to withstand the action of the gas to some extent. Rubber also is sometimes used as a container for it. When fluorine and hydrogen meet, even in the dark, an explosion occurs, hydrofluoric acid gas being formed. Fluorine decomposes water, hydrofluoric acid and ozone resulting. It is one of the elements that do not combine with oxygen.

Fluoroscope (flö-or'ō-skōp), an apparatus for observing the effects of the Roentgen or X-rays by means of their action on a fluorescent substance. It consists of a tube or box having at one end a screen coated with a fluorescent substance, such as calcium tungstate. When an object is placed between the tube in which the rays are

produced and the screen, the parts which are not transparent to the rays appear



Fluoroscope.

as a shadow on the screen of the fluoroscope.

Fluorspar, DERBYSHIRE SPAR, or FLUORITE (CaF_2), fluoride of calcium, a common mineral found in great beauty in Derbyshire. It generally occurs massive, but crystallizes in simple forms of the monometric system—viz., the cube, octahedron, dodecahedron, etc., and in combinations of the cube and octahedron. Pure fluorspar contains 48.7 per cent. fluorine, 51.3 calcium. It is of frequent occurrence, especially in connection with metalliferous beds, as of silver, tin, lead, and cobalt ores. It is sometimes colorless and transparent, but more frequently it exhibits tints of yellow, green, blue, and red. From the general prevalence of a blue tint in the Derbyshire specimens it is there known as *Blue-john*. It is often beautifully banded, especially when in nodules, which are much prized for the manufacture of vases, and it is made into a great variety of articles, chiefly ornamental. It is used as a flux in metallurgy, and is a source of hydrofluoric acid. Its specific gravity is 3.14, but it is of very inferior hardness (4), being scratchable by apatite.

Flushing (flush'ing; Dutch, *Vlissingen*), a seaport in Holland, province of Zeeland, on the island of Walcheren, at the mouth of the Hond, or West Schelde, here between 2 and 3 miles broad. It is strongly fortified, and has an extensive trade. Pop. 21,807.

Flushing, formerly a village of Queens County, New York, now a part of New York city. It is about 9 miles N. E. of the city hall and is a favorite residence of New York business men.

Flute (flōt), a portable musical instrument, consisting of a tube furnished with six holes for the fingers, and from one to fourteen keys which open other holes. The sound, which is soft and clear in quality, is produced by blowing with the mouth into an oval aperture at the side of the thick end of the instrument. Its useful compass is about two and a half octaves, including the chromatic tones. It is usually made in four pieces, and of box or ebony, sometimes, however, of ivory, silver, or even of glass.

Fluting (flōt'ing), in architecture, channels or furrows cut perpendicularly in the shafts of columns. It is used in the Doric, Ionic, Corinthian, and Composite orders, but never in the Tuscan. When the flutes are partially filled up by a smaller round molding they are said to be *cabled*.

Flux (fluks), a substance or mixture added to assist the fusion of minerals. In the large way, limestone and fluorspar are used as fluxes. In the smelting of iron the flux must be such that it will combine with the earthy matter of the ore, and form a slag, which must neither be too refractory nor fusible. The fluxes made use of in assays or chemical experiments consist usually of alkalies and alkaline salts, as borax, cyanide of potassium, carbonate of potassium, carbonate of sodium, common salt, which render the earthy mixtures fusible by converting them into glass. The fluxes used in pottery are various, but almost all consist of litharge or red lead, borax, carbonates of potassium and sodium, and sand.

Fluxions (fluk'shuns), in mathematics, the analysis of infinitely small variable quantities, an old method of calculation first invented by Newton, which does not essentially differ from that employed in the differential calculus invented by Leibnits, except in the notation. Newton's notation was adhered to by English writers up to the early part of the present century, but the differential calculus is now universally employed.

Fly (flī), a winged insect of various genera and species, whose distinguishing characteristics are that the wings are transparent and have no cases or covers. By these marks flies are distinguished from beetles, butterflies, grasshoppers, etc. The true flies, or Diptera, have only two wings, viz., the anterior pair. In common language, *fly* is the housefly, of the genus *Musca*. The housefly is found wherever man is, and in hot weather causes a great deal of annoyance. It is furnished with a suctorial proboscis, from which, when feeding on dry substances, it exudes a liquid,

which, by moistening them, fits them to be sucked. From its feet being beset with hairs, each terminating in a disc which is supposed to act as a sucker, it can walk on smooth surfaces, as a ceiling, even with its back down. The female lays her eggs (120 at a time) in horse dung or other refuse; the larvæ are small white worms. They change into pupæ without casting their skins, and in from eight to fourteen days the perfect fly emerges. Their habits render them likely to convey deleterious matter or disease germs on their feet and deposit them on food, and in consequence they are now looked upon as dangerous visitants and a crusade has been organised against them. The very small flies and the very large ones often seen about houses belong to other species. See *Blowfly*, *Botfly*, *Gadfly*.

Fly, a name formerly given to a double-seated carriage or public conveyance; afterwards applied to hackney-carriages or cabs.

Fly-catcher, a name originally given to certain insessorial birds of the genus *Muscicapa*, tribe Dentirostres, with a bill flattened at the base, almost triangular, notched at the upper mandible, and beset with bristles. Two species are British—the spotted fly-catcher (*M. grisŏla*) and the pied fly-catcher (*M.* [or *Ficedŭla*] *atricapilla*), both about the size of a sparrow. They perch on a branch, where they remain immovable, watching for insects, only leaving to make a sudden dart at a passing fly, which they seize with a snap of the bill, and then return. The white-collared fly-catcher (*M. albicollis*) is a

White-Collared Fly-catcher (*Muscicapa albicollis*).

native of Southern Europe. Numerous other birds receive the name of fly-catchers, and some, as the paradise fly-catchers of the Old World, are brilliantly colored. In America some of the tyrant birds (Tyrannidæ) are named fly-catchers.

Flying (fl'ing), the power of locomotion through the air, possessed by various animals in different degrees. Birds, bats, and many insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree-frogs, and flying-fish can move through the air in one direction for a short time, but cannot, strictly speaking, fly. The wing of a bird or insect is an elastic, flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail, so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forwards and downwards, and the bird quickly ascends. It has been shown that the wing describes a figure of 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird, the wing would be divided into two, the upper surface of one-half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and towards the body, before beginning another stroke; but it will be observed that during retraction the wing is still sloped, so that the resemblance to a kite is maintained. There are many varieties of flight among birds; of these the most remarkable is the sailing motion, in which the wings are but slightly moved. Probably the original impetus is maintained by the kite-like slope of the wing and advantage may be taken of currents by a rotation of the wing at the shoulder, a movement invisible at any distance. If the extinct Pterodactyles are excepted, all animals other than birds, bats, and insects, which move through the air, as squirrels, flying dragons, etc., do so as parachutes, going from higher to lower levels, but never rising nor flying horizontally.

Flying, Artificial. See *Aëronautics*.

Flying Boat. See *Hydro-aeroplane*.

Flying Bridge, a bridge made of pontoons, light boats, hollow beams, casks, or the like. The term is also applied to a kind of ferry in which the force of the current of a river is applied to propel a boat guided by a cable fastened from the one side to the other.

Flying Buttress. See *Buttress*.

Flying Dragon, or Flying Lizard. See *Dragon*.

Flying Dutchman, a phantom ship said to be seen in stormy weather off the Cape of Good Hope, and thought to forebode ill luck. One form of the legend has it that the ship is doomed never to enter a port on account of a horrible murder committed on board; another, that the captain, a Dutchman, swore a profane oath that he would weather the Cape though he should beat there till the last day. He was taken at his word, and there he still beats, but never succeeds in rounding the point. He sometimes hails vessels and requests them to take letters home from him. The legend is supposed to have originated in the sight of some ship reflected from the clouds. It has been made the groundwork of one or two novels, and an opera by Wagner.

Flying Fish, a name common to various fishes which have the power of sustaining themselves

Common Flying Fish (*Exocœtus volitans*).

for a time in the air by means of their large pectoral fins. Generally, however, the name is limited to the species of the genus *Exocœtus*, which belongs to the family Scomberesocidæ (mackerel-pikes). The pectoral fins, which are very large, are the principal instruments in their flight, serving to sustain the fish temporarily in the air after it has acquired an initial velocity in its rush through the water. It can pass through the air to a considerable distance, sometimes as much as 200 yards, which it does to escape from the attacks of other fishes, especially the dolphin. It is most common between the tropics. The best-known species are *E. volitans*, abundant in the warmer parts of the Atlantic, and *E. exiliens* of the Mediterranean. By some naturalists this genus has been subdivided into several, characterised by the presence or absence of barbels.

Flying Fox. See *Fox-bats*.

Flying Lemur, a name given to insectivorous mammals, natives of the Indian Archipelago and belonging to the genus *Galeopithecus*. They possess a flying membrane, which extends as a broad expansion from the nape of the neck to the tail. By means of this membrane they can take extended leaps from tree to tree.

Flying Machine. See *Aëronautics* and *Aëroplane*.

Flying Phalanger, a popular name of the members of a genus of nocturnal marsupials (*Petaurus*) nearly allied to the true phalangers. A fold of the skin extends along the flanks, and this acting as a parachute enables the animal to leap great distances, its heavy tail serving as a rudder to guide its course in the air. These animals inhabit New Guinea and Australia, where they are known as 'flying squirrels.' The species vary in size, the smallest being no bigger than a mouse. They feed on fruit, leaves, insects, etc.

Flying Squid, the popular name of a genus of cephalopodous molluscs (*Ommastrephes*), allied to the calamaries or squids, having two large lateral fins, which enable them to leap so high out of the water that they sometimes fall on ships' decks.

How Flying Fish Fly.
The arrows indicate the direction of wind and currents of air.

Flying Squirrel (*Pteromys*), a genus of rodent animals, family Sciuridæ (squirrels), to which the skin of the flank, extending between the fore and hind legs, imparts the faculty of supporting the animal for a moment in the air, as with a parachute, and of making very great leaps. The European flying squirrel (*P.* or *Sciuropterus Sibericus*) is a native of the forests in the colder parts of Europe and Asia:

the American flying squirrel (*P. volucella*) is common in the United States east of the Missouri.

Fly-trap, the only species known of a genus of plants (*Dionæa*), nat. order Droseraceæ, also called Venus's fly-trap. See *Dionæa*.

Fly-wheel, a wheel with a heavy rim placed on the revolving shaft of any machinery put in motion by an irregular or intermittent force, for the purpose of rendering the motion equable and regular by means of its momentum. Its action depends on the mechanical law that a body once set in motion retains a certain amount of moving force or momentum, which has to be overcome before motion ceases. Thus a heavy wheel which has been made to rotate by some external force such as the pressure on the piston of a steam or internal-combustion engine, continues to rotate after the external force ceases to operate by reason of its stored energy or momentum.

In a steam engine the function of the fly-wheel is to store up energy during the first part of the stroke under full steam pressure; during the latter part of the stroke, when the pressure is decreased the fly-wheel gives out energy which suffices to carry the engine over dead centers. It also equalizes the variation in the leverage with which the varying steam effort acts upon the crank to revolve the shaft and tends to equalize sudden variations in the external load or resistance. In the internal-combustion engine, which is usually single-acting with but one power stroke in every four piston movements, the fly-wheel is of especial importance in regulating the speed. See *Gas Engine*.

Fo (fō), the Chinese name of Buddha. See *Buddha*.

Foch (fōsh), General Ferdinand, famous French soldier, was born 1851 at Tarbe in the Basque country on the borders of Spain, but was raised at Metz. His father was a Bonapartist and was secretary for the prefecture of Tarbes under Napoleon III. He served in the French army in the Franco-Prussian war as a subaltern, and later became captain of artillery. He was made professor of tactics in the Ecole de Guerre with the title of commandant. When he reached the grade of brigadier-general, Clemenceau, who was then premier (1907), appointed him head of the war college. At the Battle of the Marne (September, 1914), maneuvering under General Joffre, he held the center of the French line with 120,000 men opposed to 200,000 Germans. Both his wings were driven back, but he made a terrific attack on the enemy's center, broke the German line and saved the day. He succeeded General Pétain as chief of the general staff of the Ministry of War. In March, 1918, he became generalissimo of the Allied armies, and later in the year he was made a Marshal of France.

Focus (fō'kus), (1) in optics, a point in which any number of rays of light meet after being reflected or refracted by a mirror or a lens. (2) In geom. an important point on the principal axis of the parabola, ellipse, and hyperbola. The ellipse and hyperbola have each two foci, the parabola one, though in the latter case we may suppose a second focus at an infinite distance. The foci were so called from the fact that rays of light proceeding from one focus and reflected from a corresponding reflecting surface pass through the other focus.

Fœtus (fē'tus). See *Fetus*.

Fog, a cloud at or near the surface of the earth, produced by the condensation of the invisible vapor of the atmosphere into minute watery particles, this condensation being caused by a cold current of air or the contiguity of a cold surface. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day. In low, moist places, and in confined places, as valleys, bays, or lakes, surrounded by high lands, they are of frequent occurrence.

Foggia (foj'à), a town of S. Italy, province of Foggia, 123 miles N. E. of Naples, with regular and spacious streets. Its principal edifice is a Gothic cathedral. The trade is chiefly in corn, for which immense granaries have been formed under the streets. Pop. 76,688.—The province, which is partly bounded by the Adriatic, has an area of 2954 sq. miles. It possesses rich pastures, and produces saffron, wine, etc. Pop. 418,510.

Fog-Signals, signals given by means of sound to warn vessels during fogs, when lights or other visible signals cannot be perceived. Various kinds of fog signals are used, among which may be mentioned bells, drums, gongs, guns, compressed-air whistles, steam-whistles, and fog trumpets or horns. One of the most powerful signals is the siren fog-horn, the sound of which is produced by means of a disk perforated by radial slits made to rotate in front of a fixed disk exactly similar, a long iron trumpet forming part of the apparatus. The disks may each contain say twelve slits, and the moving disk may revolve 2800 times a minute; in each revolution there are of course twelve coincidences between the slits in the two disks; through the openings thus made steam or

air at a high pressure is caused to pass, so that there are actually 33,600 puffs of steam or compressed air every minute. This causes a sound of very great power, which the trumpet collects and compresses, and the blast goes out as a sort of sound beam in the direction required. Under favorable circumstances this instrument can be heard from 20 to 30 miles out at sea. Fog signals are also used on railways during foggy weather; they consist of cases filled with detonating powder, which are laid on the rails and exploded by the engine when it runs over them.

Föhr (feur), a Prussian island in the North Sea, off the west coast of Schleswig; area, 28 sq. miles; pop. about 4000, mostly Frisians engaged in fishing, the capture of wild fowl, and agriculture.

Foil, a thin leaf of metal, as gold or tin, used for various purposes.

Foil, in fencing, a rod of steel, representing a sword, with a handle or hilt at one end, and a leather button at the other to prevent accidents. Foils measure from 31 to 38 inches in length and must be resilient.

Foix (fwâ), a town of France, capital of dep. Ariège, in a valley at the foot of the Pyrenees, with remains of the old castle of the counts of Foix, and an old church and abbey. Pop. (1906) 4498.

Foix, Gaston de. See *Gaston de Foix.*

Fokien (fo-kē-en'), a maritime province of Southeastern China; area about 40,000 sq. miles. The coast is deeply indented by bays and studded with islands. The interior is generally mountainous, but is highly cultivated and generally fertile. The principal products are rice, wheat, barley, tea, silk, sugar, indigo, camphor, and tobacco. The capital is Foo-choo-foo. Pop. about 25,000,000.

Fokschani (fok-shä'nē), a town of Roumania, on the Miklov, 104 miles N. E. of Bukarest, with an important trade. Pop. 23,783.

Folc-land (fōk-land), that is Folkland, the land of the people, that portion of Anglo-Saxon England which was retained on behalf of the community. It might be occupied in common or possessed in severalty, but could not become allodial estate or absolute private property except with the consent of the Witan or highest council in the land. From time to time large grants were made both to individuals and to communities; and land thus cut off from folc-land was called *boc-land* or 'book-land.' Ultimately the king practically acquired the disposal of it, and the remnant of folc-land became crown lands. See *Feudal System.*

Folc-mote, in Anglo-Saxon England, an assembly of the people to consult respecting public affairs.

Foley (fō'li), John Henry, sculptor, born at Dublin in 1818; died at Hampstead in 1874. He was admitted a student of the Royal Academy in 1835. In 1848 he was elected an associate, and in 1858 an academician. His works are numerous and highly esteemed. They include statues of Selden and Hampden in Westminster; Goldsmith, Burke, and O'Connell in Dublin; Lord Hardinge and Outram for India; Lord Clyde in Glasgow; the group *Asia* and the colossal statue of Prince Albert for the Albert Memorial, Hyde Park. Foley was buried in St. Paul's Cathedral.

Foliation (fō-li-ā'shun), in geology, the property or quality in certain rocks of dividing into thin laminæ or plates.

Foligno (fo-lēn'yo), a town of Central Italy, province of Perugia, in a beautiful vale of the Apennines, watered by the Clitumnus. Public buildings worthy of notice are the cathedral and the Palazzo Communale. Pop. of commune, 26,278.

Folk (fōk), Joseph Wingate, political reformer, was born at Brownsville, Tennessee, in 1869. He studied law, was admitted to the bar in 1890, and in 1900 became circuit attorney in St. Louis. As such he developed and successfully prosecuted numerous bribery cases, and became so popular that he was elected Governor of Missouri in 1905, filling this office till 1909.

Folkestone (fōk'ston), a seaport of England, County Kent, 6 miles W. by S. of Dover, terminus of the Southeastern Railway, and a chief station for steamers to and from Boulogne. It is a favorite watering place, and has a considerable shipping trade. Folkestone is included in the parliamentary borough of Hythe. Pop. (1911) 33,495.

Folklore (fōk'lōr), a useful term of recent introduction into the English language, signifying a scientific study of popular tales, traditions, primitive beliefs and superstitions, popular customs, usages, festivals, games, etc. Folklore, though it takes cognizance of many apparently trivial matters, is of great importance in the science of comparative mythology, and helps to throw much light on the relationships between races, and on the origin and development of religious beliefs and ceremonies. It

is, therefore, of great assistance to the ethnologist, the sociologist, and the historian, as well as to the student of comparative mythology and of the science of religion. Folklore societies have been formed in several countries, the American society being formed at Cambridge, Mass., in 1888. Its most important purpose is to collect the relics of folklore still existing in America.

Fomentation (fō-men-tā'shun), in medicine the application of warm liquids to a part of the body, by means of flannels or other cloths

Palace of Fontainebleau.

dipped in hot water or medicated decoctions, for the purpose of easing pain by relaxing the skin or deeper tissues.

Fonblanque (fon'blangk), ALBANY WILLIAM, an English journalist, born in 1797; died in 1872. He was educated for the bar, but, devoting himself to journalism, he gained a position on the *Times*, the *Morning Chronicle*, and succeeded Leigh Hunt as editor of the *Examiner*. A reprint of many of his articles, under the title *England Under Seven Administrations*, appeared in 1837. In 1852 he was appointed chief of the statistical department of the Board of Trade.

Fond du Lac, a city of Wisconsin, capital of a county of same name at the south end of Winnebago Lake, 60 miles N. by W. of Milwaukee. It is the center of several railways, and has a large trade. The industries include iron founding, carriage and wagon making, tanning, sawmilling, and the manufacture of caskets, refrigerators, cement blocks and candy, etc. Pop. 18,797.

Fondi (fon'dē), a town of South Italy, near a coast lagoon to which it gives name, prov. Caserta. It is a bishop's see, and contains a cathedral. Fondi stands in a plain, the ancient *Cæcubus Ager*, which produced the famous Cæcuban wine. Pop. 9930.

Fonseca (fon'sā'kā), MANUEL DEODORO, soldier and president, was born in Brazil in 1827; died in 1892. He spent nearly all his life in the army, being finally made marshal of the empire. Becoming hostile to the government he was deprived of his command and banished. He now became leader of the revolutionists, drove the emperor from the throne and was made dictator and provisional president in 1889. In 1891 he was elected the first president of the Republic of Brazil, but his dictatorial rule led to opposition and he was forced to abdicate.

Font, the vessel which contains the water for baptism in a church. It is frequently sculptured in stone or marble, with richly decorative designs.

Fontaine, JEAN DE LA. See *La fontaine*.

Fontainebleau (fon-tān-blō), a town of France, dep. Seine-et-Marne, in the midst of the forest of same name, about 2 miles from the Seine and 37 miles S. S. E. Paris. It owes its origin chiefly to the palace, and is a quiet place, with broad, clean streets. Pop. (1906) 11,108. The castle or palace of Fontainebleau is one of the most magnificent in France. It occupies the site of a fortified chateau founded by Louis VII in 1162; this was converted into a mag-

nificent palace by Francis I, and much added to by Henry IV, Napoleon I, Louis Philippe, and Napoleon III. The park is laid out like a vast garden, and adorned with statues, temples, fountains, lakes, and waterfalls. The forest, which is about 50 miles in circumference, covers an area of 42,500 acres, affords numerous pleasant, attractive walks, and abounds with game.

Fontana (fon-tä'nä), DOMENICO, an Italian architect and engineer, born in 1543; died in 1607. He was employed by Pope Sixtus V in many great works, among the chief of which was the erection of the Egyptian obelisk in front of St. Peter's. Among other buildings erected by Fontana were the Lateran Palace and the library of the Vatican. He also executed important works at Naples.

Fontana, PROSPERO, an Italian painter, born at Bologna in 1512; died at Rome in 1597. He excelled in design and composition, and adorned several churches in Rome and Bologna with historical frescoes. Among his pupils were his daughter LAVINIA (born 1552, died 1614), who excelled in portraits, and the brothers Caracci.

Fontenay-le-Comte (fo̱nt-nā-lė-kō̱nt), a French town, dep. Vendée, 27 miles N. E. of La Rochelle. Has a fine Gothic church with spire 311 feet high; manufactures coarse linen and woolen cloths, and is an entrepôt for the Gironde and Charente wines. Pop. (1906) 7639.

Fontenelle (fo̱nt-nāl), BERNARD LE BOVIER DE, a French author, born at Rouen 1657; died 1757. In 1674 he went to Paris, and soon became known by his poetical effusions and learned works. Before the age of twenty he had assisted in the composition of the operas of *Psyche* and *Bellerophon*, which appeared under the name of his uncle, Thomas Corneille. In 1681 he brought out his tragedy *Aspar;* but it and the other dramas and pastorales with which he opened his literary career were on the whole unsuccessful. In 1683 appeared his *Dialogues of the Dead*, which were favorably received. His *Discourse on the Plurality of Worlds* (1686) was the first book in which astronomical subjects were discussed with taste and wit. Among his other works are the *History of Oracles* and an *Essay on the Geometry of the Infinite.*

Fontenoy (fo̱nt-nwä), a village in Belgium, province of Hainaut, celebrated for the battle of May 11, 1745, in which the French under Marshal Saxe defeated the British, Austrian, and Dutch allied forces under the Duke of Cumberland.

Fontevrault (fo̱n-tė-vrō), a village of N. W. France, dep. Maine-et-Loire, in a valley 10 miles southeast of Saumur. Here was formerly a rich Benedictine abbey (now a prison) founded in 1099, containing both monks and nuns, and governed by an abbess. The abbey became the head of an order, and had many dependencies. The old monastic buildings, covering from 40 to 50 acres, are now used as a central prison. In the abbey church are the tombs of Henry II and of Richard I, Kings of England and Counts of Anjou, of Eleanor, wife of Henry II, and Elizabeth, wife of John, King of England.

Foo-chow (fu-chou), a town of China, capital of the province of Fokien, on the Min, 125 miles N. E. of Amoy. It consists of the town proper, surrounded by walls, and of extensive suburbs stretching along both sides of the river, and communicating by a stone bridge. Foo-chow is one of the five ports thrown open by the treaty of 1843. The trade is very extensive, but the navigation of the river from the sea to the harbor is difficult. Foo-chow has a large arsenal and dockyard superintended by European officers; it is also a great literary center. Pop. estimated at 700,000.

Food. See *Aliment*, *Dietetics*, and *United States.*

Fool. See *Jester.*

Foolah. See *Fellatah.*

Fools, FEAST OF, the name given to festivals regularly celebrated, from the fifth to the sixteenth century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies. The feast of fools was an imitation of the Roman Saturnalia, and, like this, was celebrated in December. The chief celebration fell upon the day of the Innocents, or upon New Year's Day; but the feast continued from Christmas to the last Sunday of Epiphany. The young people, who played the chief parts, chose from among their own number a mock pope, archbishop, bishop, or abbot, and consecrated him, with many ridiculous ceremonies, in the chief church of the place. They often travestied the performance of the highest offices of the church, while others, dressed in different kinds of masks and disguises, engaged in indecent songs and dances, and practised all possible follies in the church. Except from their association with the Saturnalia nothing is

known of the origin of these extravagancies, which appear to have been very ancient. They were most common in France, but the feast was also observed in Spain, Germany, England, and Scotland. In France it survived till the year 1644.

Foolscap (fōls'kap), paper of the smallest regular size but one (about 13½ by 16½ inches); so called from its water-mark in early times being the outline of a fool's head and cap, for which British papermakers now substitute the figure of Britannia.

Fool's Parsley, the popular name of *Æthusa Cynapium*, nat. order Umbelliferæ, which grows wild in some places in the Northern States. It is commonly believed to be poisonous, and serious accidents are said to have occurred from its being mistaken for parsley; but if poisonous it is so only in certain localities. Its unilateral reflexed floral leaves distinguish it from most plants to which it is allied.

Foo-shan (fō-shan), a town of China, prov. of Quangtong, 21 miles s. w. of Canton, on one of the branches of the delta of Si-kiang. Pop. est. at 400,000.

Foot, a measure of length, the name of which is derived from the length of the human foot, containing 12 linear inches.—*Square foot* is a square whose side is one foot, and is therefore equal to 144 square inches.—*Cubic foot* is a cube whose side is 1 foot, and the cube contains 1728 cubic inches. The foot is a common measure in various countries, but its dimensions vary considerably.

Foot, in prosody, a measure consisting of a variety of syllables, two, three, or four, in combinations of long and short, or accented and unaccented. In Greek and Latin verse the feet depend on the *quantity*, or length of the syllables, each foot having a distinctive name—trochee, iambus, dactyle, anapest, etc. The same names are applied to English measures, an accented syllable in English being held to be equivalent to a long syllable in Latin or Greek, and an unaccented syllable to a short.

Foot, in animals, the lower extremity of the leg; the part of the leg which treads the earth in standing or walking, and by which the animal is sustained and enabled to step; or that surface of the body by which progression is effected among the mollusca. The foot of man is composed of twenty-six bones, seven of which constitute the tarsus or ankle, which articulates with the leg and corresponds to the carpus (wrist). Five bones form the metatarsus, which corresponds to the metacarpus, and articulates with the tarsus behind, and with the toes in front. The foot is narrow and thick in its posterior part, thinner and broader anteriorly; it forms a right

Skeleton of the Human Foot.

a to *bb*, Tarsus. *bb* to *cc*, Metatarsus. *cc* to *d*, Phalanges. 1, Os calcis, calcaneum, or heel-bone. 2, Astragalus. 3, Scaphoid bone. 4, Inner cuneoid bone. 5, Middle cuneoid bone. 6, Outer cuneoid bone. 7, Cuboid bone. 8 to 12, Metatarsal bones. 13, First row of phalanges. 14, Last row of phalanges.

angle with the leg, and rests upon the ground at the extremities only. The middle portion is in the form of an arch, and, in consequence, resists shocks and supports pressure much better than it could if it were flat and touched the ground throughout its whole length. Absence of the arch constitutes flatfoot.

Foota (fō'tà), a territory of Senegambia, W. Africa, on the lower Senegal, which bounds it on the northeast. It includes Foota Toro, and other districts. Area, about 15,000 sq. m.; pop. estimated at 400,000. The natives profess Mohammedanism, and the country is divided into three districts, each formerly governed by its own chief, subject to a sovereign chosen from a few privileged families. It is now under French control.

Foota-jallon (fō'ta-jal'on), a region of West Africa, intersected by lat. 12° N. and lon. 13° W. It is extremely mountainous, and is the source of the rivers Senegal, Gambia, and Grande. Large herds and flocks are pastured in the highlands; and the soil produces in abundance oranges and bananas, and palm trees, which furnish dates, wine, and oil. The inhabitants are Mohammedans, and are estimated at 700,000.

Foot-and-mouth Disease, a highly contagious eczematous affection which attacks the feet and mouths of cattle, manifesting itself by lameness, indisposition to eat, and general febrile symptoms, with ultimately eruptions of small vesicles on the parts affected, and general indisposition of the animal. The disease occasionally spreads to the udder of milch cattle, and it is believed that it

may be communicated to persons who drink the milk of cows so affected.

Football, an outdoor game of considerable antiquity. In former times towns and villages were often matched against each other, the whole of the able-bodied inhabitants taking part in the struggle; the goals being often miles apart, and usually consisting of natural objects, as a brook or river. The modern form of the game is played by two parties of players, on a large level piece of ground, generally oblong in shape, and having in the middle of either of the ends a goal formed by two upright posts 6 to 8 yards apart, with a bar or tape extended between them at the height of 8 or 10 feet from the ground. There are various styles of playing the game, but the two recognized in all important matches are the Rugby game and the Football Association game, the game played in the United States being a variation of the English Rugby. In both games the main object is for either party to drive the ball (which is *kicked off* in the center of the field) through the goal that their opponents are guarding, and thus count a goal against them. In the Rugby game the goal-posts are 18½ feet apart, and joined by a cross-bar at a height of 10 feet from the ground; and to score a goal the ball must be kicked over this bar by one of the opposite side. In the Association game the upright poles are 8 yards apart, and joined at 8 feet from the ground by a tape, under which the ball must pass to secure a goal. The Rugby game is much rougher and less scientific than the Association game, which discourages rough play and relies mainly on the skilful maneuvering of the ball with the feet, it being forbidden to touch the ball with the hands; while by the Rugby rules the player may catch the ball in his hands, run with it, and kick it dropping. When a goal is made, or at some other arranged interval, the parties change ground for the next struggle, so that any inequalities of situation may be balanced. The roughness of play, and frequent accidents—occasionally fatal—have led to certain modifications in the game, with the purpose of eliminating its more dangerous feature and substituting skill and agility for brute strength.

Foote, ANDREW HULL, naval officer, born at New Haven, Connecticut, in 1806. He entered the navy in 1822, was engaged in suppressing the African slave trade in 1849-52, and was in command of the China station in 1856. Here, while seeking to protect American property when the Chinese were at war with the English, he was fired upon by the Chinese. An apology being refused, he stormed and captured four Chinese forts. In 1862 he commanded the river fleet in the advance on Forts Henry and Donelson and aided Grant in their capture. He was promoted rear admiral in the same year, but died while preparing to join his flagship in 1863.

Foote, SAMUEL, an English comic writer and actor, born about 1720 at Truro; died at Dover in 1777. He was educated at Oxford, and entered the Temple; but after a course of dissipation, to which his small fortune fell a sacrifice, he turned his attention to the stage. He appeared first in Othello, but had little success as a tragedian. In 1747 he opened the theatre in Haymarket, with a dramatic piece which he entitled *The Diversions of the Morning*. It consisted of some very humorous imitations of well-known characters, in detached scenes, written by Foote, who always took the leading parts himself. After 1752 he performed alternately in London and Dublin. He did not obtain a patent for the Haymarket till 1766. Of his numerous plays, above twenty in number, hardly one is now acted. His humor is described by Dr. Johnson and other witnesses as irresistible.

Footguards. See *Guards*.

Footlights, in theaters, the row of lights placed on the front of the stage and on a level with it, to light it up.

Foot-pound, in physics, the term expressing the unit selected in measuring the work done by a mechanical force. A foot-pound represents 1 lb. weight raised through a height of 1 foot; and a force equal to a certain number of foot-pounds, fifty for example, is a force capable of raising 50 lbs. through a height of 1 ft.

Foot-rot, a disease in the feet of sheep, the more common form of which is an inordinate growth of hoof, which at the toe, or around the margin, becomes turned down, cracked, or torn, thus affording lodgment for sand and dirt. In the second form of the disease the foot becomes hot, tender, and swollen; there are ulcerations between the toes, followed by the sprouting of proud flesh.

Footstalk: (1) In botany, a petiole; the stalk supporting the leaf, or connecting it with the stem or branch. (2) In zoology, a process resembling the footstalk in botany, as the muscular process by which certain of the brachiopoda are attached, the stem

which bears the body in barnacles, the stalk which supports the eyes in certain crustaceans.

Foraker (for'a-ker), JOSEPH BENTON, statesman, born near Rainsboro, Ohio, in 1846. He served as a private in the Civil war, afterwards studied law and began practice in Cincinnati in 1869. He was judge of the Superior Court of that city, 1879-82, governor of Ohio, 1885-89, and United States Senator, 1897-1909. He was known as 'the bulldog of politics.' Died May 10, 1917.

Foraminifera (fo-ra-mi-nif'e-ra), an order of animals of low type belonging to the class Rhizopoda, sub-kingdom Protozoa, furnished with a shell or test, simple or complex, usually perforated by pores

FORAMINIFERA (recent).

1, Planorbulina Ugeriana. 2, Triloculina tricarinata. 3, Globigerina bulloides. 4, Rotalia Beccarii. 5, Nonionina turgida.

(*foramina*), whence the name. The shell may be composed of horny matter, or of carbonate of lime, secreted from the water in which they live. Owing to the resemblance of their convoluted chambered shells to those of the nautilus, they were at first reckoned among the most highly organized molluscs. In reality they are among the simplest of the protozoa. The body of the animal is composed of granular, gelatinous, highly elastic sarcode, which not only fills the shell, but passes through the perforations to the exterior, there giving off long thread-like processes called *pseudopodia*, interlacing each other so as to form a net like a spider's web. Internally the sarcode-body exhibits no structure or definite organs of any kind. Foraminifera appear very early in the geological formations. The great formation known as white chalk is largely composed of foraminiferous shells, while another remarkable formation known as Nummulitic Limestone receives its name from the presence of coin-shaped foraminifers, generally about as large as an English shilling.

Forbes (forbs), DUNCAN, of Culloden, a Scottish lawyer, lord-president of the Court of Session, born 1685; died 1747. He studied law at Edinburgh and Leyden; was called to the bar in 1709, and immediately after appointed Sheriff of Midlothian. In 1737 he became lord-president of the Court of Session, in the procedure of which he made many improvements. In 1734, in consequence of the death of his brother, he fell heir to the estate of Culloden. He devoted himself to the improvement of the industry of Scotland, and materially aided in laying the foundations of its commercial prosperity. It was mainly owing to his exertions that the rebellion of 1745 was prevented from spreading more rapidly among the clans. He wrote several religious works: *Thoughts on Religion; Reflections on the Sources of Incredulity in Regard to Religion; Letter to a Bishop, etc.*

Forbes, EDWARD, a British naturalist, was born at Douglas, Isle of Man, 1815; died at Edinburgh in 1854. He early devoted himself to science, and having made scientific journeys in Norway, Sweden, France, Germany, etc., he was attached to a scientific expedition to the Mediterranean, the result of which appeared in a report presented to the British Association, and in *Travels in Lycia*. In 1842 he became professor of botany at King's College, London. On the opening of the School of Mines, Forbes was appointed lecturer on natural history as applied to geology and the arts. He still retained his professorship of botany at King's College, and continued to contribute annually some of his most valuable memoirs to the British Association, besides writing for scientific and literary journals. In 1853 he was appointed to the chair of natural history in Edinburgh. Among his more important works, which include a great number of valuable papers on zoological, botanical, and literary subjects, are a *History of the Star-fishes* and *History of British Mollusca*.

Forbes (forbs or for'bes), JAMES DAVID, a Scottish scientist, born in 1809; died in 1868. He was educated at Edinburgh University, and admitted to the Scottish bar. In 1833 he was appointed to the chair of natural philosophy in the University of Edinburgh. In 1860 he became principal of the United Colleges of St. Salvador and St. Leonard, in the University of St. Andrews. His fame rests chiefly on his study of glaciers. His chief publications on this subject are: *Travels through the Alps of Savoy; Norway and its Glaciers; Tour*

of Mont Blanc and Monte Rosa; and *Occasional Papers on the Theory of Glaciers.* Forbes's theory of the glacier was that it was a viscous body, urged down slopes of a certain inclination by the mutual pressure of its parts. See *Glaciers.*

Forbes, Sir John, a Scottish physician, born in 1787; died in 1861. He settled in London in 1840, where he became physician to Queen Victoria. He was the founder of the British and Foreign Medical Review, published a number of professional and other works, and contributed to the *Cyclopedia of Practical Medicine.*

Forbes-Robertson, Sir Johnston, celebrated English actor, born in London, January 16, 1853. He was educated at Charterhouse and studied at the Royal Academy of Arts with the idea of becoming a painter; but in 1874 turned to the theater, making his first appearance in London as Chastelard in *Mary Queen of Scots.* In 1895 he began playing under his own management with Mrs. Patrick Campbell, producing *Romeo and Juliet, Hamlet, Macbeth,* and some modern plays. In 1900 he married the actress Gertrude Elliott, with whom as his leading lady he appeared in Shakespearean and modern plays. He retired in 1914.

Force (fōrs), that which is the source of all active phenomena occurring in the material world, and of which motion, gravitation, heat, light, electricity and magnetism, cohesion, and chemical affinity are believed to be exhibitions. Mechanical force is the power which produces or modifies motion or tends to do so. It has its origin in three causes: (1) gravitation; (2) the unknown cause of the phenomena of light, heat, and electricity; and (3) life. Mechanical forces are of two sorts: one of a body at rest, being the same as pressure or tension; the other of a body in motion, being the same as impetus or momentum. When two forces act on a body in the same *line of direction* the resulting force, or *resultant* as it is called, will be the sum of both forces. If they act in opposite directions the body will remain at rest if the forces be equal; or, if the forces be unequal, it will move with a force equivalent to their difference in the direction of the greater. If the lines of direction make an angle with each other the resultant will be a mean force in an intermediate direction. The *composition of forces* is the combining of two or more into one (actually or hypothetically), which shall have the same effect when acting in some given direction; the *resolution of forces* is the decomposing of a single force into two or more forces, which, acting in different directions, shall be equivalent to the single force. Forces have different denominations according to their nature and the manner in which they act: thus we have accelerating forces, constant forces, parallel forces, uniform and variable forces, etc. The *unit of force* is a single force in terms of which the amount of any other force is ascertained. See *Dynamics, Energy.*

Forceps (fōr'seps), a general name for a two-bladed instrument on the principle of pincers or tongs, used for seizing and holding, and for extracting objects, which it would be impracticable thus to treat with the fingers. Such instruments are used by watchmakers and jewelers, by dentists in extracting teeth, for holding parts in dissection, for extracting anything from a wound, taking up an artery, and by accoucheurs, etc.

Force-pump. See *Pump.*

Forcible Detainer, a violent withholding of the lands, etc., of another from his possession.

Forcible Entry, the violently taking possession of lands or tenements.

Forcing (fōrs'ing), a method of cultivation by which plants, flowers, and fruits are raised at an earlier season than the natural one by protecting them under glass in hot or cold frames, by using stimulating fertilisers, and other means.

Ford, Henry, automobile manufacturer, was born at Greenfield, Michigan, in 1863. He became a machinist, was chief engineer of the Edison Illuminating Company of Detroit, and finally engaged in automobile manufacture, organizing the Ford Motor Company. The cars built by this company were of small size and cheap construction, their price being so low that the business grew enormously. It has become the largest of its kind in the world, turning out nearly 2000 cars daily and employing 50,000 workmen. The plan of profit-sharing has been introduced, under which $10,000,000 annually has been distributed among the employees. In 1915 Mr. Ford chartered a ship and took a party of peace advocates to Europe, with the hope of in some way ending the war. This enterprise failed.

Ford, John, an early English dramatic author, born in 1586; died about 1640. He entered the Middle

Temple in 1602, and appears to have practised as a lawyer. In 1606 he published a monody on Charles Blount, Lord Mountjoy, afterwards Earl of Devonshire. His dramas are: *The Lover's Melancholy* (1629); *'Tis a Pity She's a Whore* (1633); *The Broken Heart* (1633); *Perkin Warbeck* (1634); *The Fancies Chaste and Noble* (1638); *The Lady's Trial* (1639); *The Sun's Darling* (1657), and several others written in conjunction with Dekker, Webster, and others.

Ford, Paul Leicester, novelist, born at Brooklyn, New York, in 1865. He is best known by his very successful novel, *The Honorable Peter Stirling*. He also wrote *Janice Meredith*, and others; edited the writings of Jefferson and Dickinson, etc. He was killed by his brother, Malcolm, in 1902.

Fordun (for'dun), John, the father of Scottish history, born probably at Fordoun, Kincardineshire, soon after 1300; died about 1386. He wrote the first five books of his history known as the *Scotichronicon* (in Latin), bringing it down to 1153, and part of the sixth, and left materials for its continuation down to his own period. It was resumed about 1441 by Walter Bower, abbot of the monastery of Inchcolm, by whom the five books of Fordun were enlarged, and eleven new ones added, bringing the history down to 1437. It exists in numerous MS. copies, and several printed editions have been published, the best of which is that of W. F. Skene, Edinburgh, 1871-72, with translation.

Fore-and-aft, in ships, a term meaning in a line with the keel. *Fore-and-aft sails* are those that are set on a stay or gaff and boom, such as jibs, staysails, etc.

Forecastle (fōr'kas-l or fōk'sel), a short deck in the forepart of a ship of war, or forward of the foremast, above the upper deck. In merchant ships it is the forepart of the vessel, where the sailors live.

Foreclosure (fōr-klō'zūr), in law, is the right of a mortgagee, or of any one having interest in a mortgage, in the event of the conditions of the mortgage being violated, to compel the mortgagor to redeem the pledge or forfeit his right of redemption.

Foreign Attachment. See *Attachment.*

Foreign Bill of Exchange. See *Bill.*

Forensic Medicine (fō-ren'sik), the branch of medical education which applies the principles and practice of the different branches of medicine to the elucidation of doubtful questions in a court of justice; otherwise called medical jurisprudence.

Foreshortening (fōr-short'en-ing), in drawing and painting, the art of representing figures

Foreshortened (after figure by Raphael).

in such a manner as to convey to the mind the impression of the entire length of any object which is pointing more or less directly towards the spectator standing in front of the picture. The projecting object is shortened in proportion to its approach to the perpendicular to the plane of the picture, and in consequence appears of a just length.

Forest (for'est), a term properly applied to an extensive wood, or to a large tract of mingled woodland and open and uncultivated land; but also given to a large tract of hilly or mountain land wholly or chiefly devoted to the purposes of the chase. (See *Deer-forest.*) Forests proper are of much importance in the general economy of the globe. They greatly affect climate; and their beneficial influence in a physical, economical, and hygienic aspect is now receiving increased attention. Immense forests exist in the Western continent, both in the north and south, the vegetation appearing to possess no limits. In the United States, nevertheless, the forests, though still of great extent, are gradually disappearing; but those of Canada remain very large. In South America, the whole of the valley of the Amazon, which embraces one-third of the entire area of that country, is one vast forest. In Africa also there are forests of immense extent, and the same is the case in Northern Russia, especially in Siberia.

Foresters (for'est-ers), there are several fraternal benefit

Forests

FOREST PLANTING REGIONS
OF THE
UNITED STATES
The Unshaded Areas are Treeless
Except Along the Streams
1 EASTERN REGION
2 CENTRAL TREELESS REGION
3 WESTERN REGION
TROPICAL FOREST
TROPICAL FOREST
1
2
3

societies under this name, including the Ancient Order of Foresters, founded in England in 1745, established in the United States in 1809; the Foresters of America, founded in 1864, and the Independent Order of Foresters, 1874.

Forestry (for'es-tri), the act or art of forming and cultivating forests. The usefulness of forests to man lies: (1) In furnishing him with timber for building, manufacturing, fuel, etc., and with various other useful products of trees. (2) In their influence on climate. (3) In their influence on waterflow, by keeping the ground more moist, making the outflow more regular, checking the rapid melting of snow, and keeping the hillsides from being denuded of their soil, thus setting up streams and covering cultivated valley lands. The necessity of a proper preservation of the forests seems highly evident, but the nations have been slow in waking up to this fact. Several of the countries of Europe have been largely stripped of their woodlands by indiscreet cutting in the poorest countries, and only recently have the nations been roused to the necessity of their conservation. This is now being carefully attended to in several countries, especially in Germany. In China broad mountain regions have been stripped of their trees, with the result that this soil has been swept away by the rains, leaving the rocks bare, while broad reaches of formerly fertile lowlands have been made sterile by the material spread over them by the rains that swept the mountain slopes.

In the United States the broad original forests have been very largely cut away, and those remaining have of late years been so largely reduced by indiscriminate cutting and the ravages of carelessly kindled fires that great alarm is felt as to the future of the lumber supply. Within recent years vigorous efforts have been made to overcome this growing evil. The American Forestry Association, founded in 1882, its purpose being the conservative use of our forest resources, has now over 5000 members, residents of every state, and of Canada and foreign countries. The first State Forest Commission was organized by New York in 1885 and has now a very large forest reserve set aside in the Adirondacks. Pennsylvania has also large forest reserves in its mountain districts, and many other states have taken similar action. The art of forestry is also being taught in the schools, and a large body of skilled foresters are now in the service of the states and the general government. In the Department of Agriculture has been organized a Division of Forestry, and the most earnest efforts are being made to prevent any further needless waste of our woodlands. In the new and active movement for the conservation of national resources the preservation of the public forests ranks high, and to aid in this purpose the government has withdrawn as national forest areas a vast amount of the public lands, amounting at the present time to 192,931,197 acres, an area about equal to that of Texas and Ohio combined. These woodlands are under the charge of the National Forest Service and cared for by about 3000 men, of whom 250 are professional foresters. The trees in these forests are cut with careful discrimination, and new trees are planted to take their place, there being forest nurseries containing about 20,000,000 plants and capable of supplying 18,000,000 a year. New York has 1,600,000 acres in its forest reserve, Pennsylvania over 920,000, and the reserves of the other states amount to a very considerable area. Arbor day is a useful institution in this connection, large numbers of trees being planted on that day and the need of conserving the forests taught to the growing generation in a practical manner.

Forest City, a borough in Susquehanna County, Pennsylvania, 6 miles N. of Carbondale. It has coaling industries, silk and knitting mills, etc. Pop. 5749.

Forest-fly, the popular name of a family (Hippoboscidæ) of two-winged flies, parasitic on birds and quadrupeds.

Forest Marble, in geology, an argillaceous laminated, shelly limestone, alternating with clays and calcareous sandstones, and forming one of the upper portions of the lower Oolite; so called from Whichwood *Forest*, in Oxfordshire.

Forest Park, a residential village in Proviso township, Cook County, Illinois, near Chicago, on the Desplaines River. Pop. 9000.

Forfar (far'far), or ANGUS, a maritime county on the east coast of Scotland, bounded N. by Counties Aberdeen and Kincardine, W. by Perth, S. by the Firth of Tay, and E. by the German Ocean; area 890 sq. miles. The surface is covered in the west and northwest by a portion of the Grampians known by the name of the Braes of Angus, and in the south by part of the Sidlaw Hills. Nearly half the area is under crops and cattle rearing

is carried to great perfection, the chief breeds being shorthorns and polled Angus. The staple manufacture is coarse linens, which is more or less carried on in all the towns and villages, but has its central locality at Dundee. Sandstone flags are largely quarried in the Arbroath district. Pop. 284,078.—The county town, Forfar, is 13 miles north by east of Dundee. The staple manufacture is linen, especially of the coarser varieties, there being several large factories in the town, in connection with which are several bleachworks. Pop. 12,882.

Forfeiture (for'fi-tūr), a punishment annexed to some illegal act or remissness of an owner or tenant of property, whereby he loses his interest therein, together with his title, the same going to the party injured by such act or remissness.

Forge (fōrj), a workshop or other establishment in which iron or other metal is hammered and shaped by the aid of heat; also, the works where iron is rendered malleable by puddling and shingling. For military purposes a traveling forge is used by forces in the field.

Forgery (fōr'je-ri), at common law, the fraudulent making or alteration of a writing to the prejudice of another man's rights, or making, *malo animo*, of any written instrument for the purpose of fraud and deceit; the word *making*, in this last definition, being considered as including every alteration of or addition to a true instrument. The punishment of forgery at common law is, as for a misdemeanor, by fine, imprisonment, and such other corporeal punishment as the court in its discretion shall award. Most, and perhaps all, of the states in the Union have passed laws making certain acts forgery, and the national legislature has also enacted several on this subject; but these statutes do not take away the character of the offense as a misdemeanor at common law, but only provide additional punishment in cases enumerated in the statutes.

Forget-me-not, the name of *Myosōtis palustris*, nat. order Boraginaceæ, annual and perennial herbs. Nearly fifty species have been described. Scorpion-grass is also a name for it and others of its genus. It is a very beautiful plant, and considered to be the emblem of friendship wherever it is grown. Its flowers are bright blue with a yellow eye. Species are found in the United States. The dark-blue forget-me-not of the Azores (*M. Azorica*) is now cultivated in greenhouses, and is much esteemed for the brilliancy of its flowers.

Forli (fōr-lē'), a town of North Italy, capital of a province of same name, 38 miles southeast of Bologna. It is handsome and well built, has manufactures of silk ribbons, silk twist, woolen stuffs, etc., and a considerable trade. Forli has a cathedral and is a bishop's see. Pop. 43,321.—The province of Forli is bounded on the east by the Adriatic; area 716 sq. miles; pop. 279,072.

Forlorn Hope, a body of men, usually volunteers, selected from different regiments, to lead an assault, enter a breach, or perform other service attended with uncommon peril. The term is of Dutch origin; *hope* being from Dutch *hoop*, a company.

Form, as a metaphysical term, has been defined as the essence of the thing from which result not only its figure and shape, but all its other qualities. Hence it is all that makes a thing intelligible to the mind, in contradistinction to *matter*, thus regarded as a kind of unknown substance or substratum.

Formal hyde (for-mal'dē-hīd), or Formic Aldehyde, is a colorless, pungent, irritating gaseous body (CH_2O), with characteristic odor and very decided antiseptic and bactericidal properties. It is the best bactericide known, acting effectively in the gaseous state. It was first produced by Hofmann in 1868. It is made by the action of heat on wood alcohol, being an oxidation product. It is very irritating to the mucous membrane of the eyes and nose, inflammation resulting after much inhalation of it. It is used by Boards of Health, being sprinkled or poured on the floor of a room, all outlets being fastened so as to keep the gas confined therein. Thus used, it acts as a disinfectant, destroying disease germs. The odor may be removed afterwards by ammonia, which is sprinkled about the apartment. It is also used to harden and preserve pathological and histological specimens, etc. It is made and used internally as hexamethylenamin, etc., much diluted with water, in some forms of cystitis, etc.

Formation (for-mā'shun), in geology, any series of rocks referred to a common origin or period, whether they consist of the same or different materials. Geological strata are divided into certain groups of one era of deposition, sometimes of very dissimilar mineralogical character, but enclosing the same fossil species; as, the

Carboniferous, Oolitic, Cretaceous, Silurian, Laurentian, etc., *formations*. See *Geology*.

Formentera (for-men-tē'ra), one of the Balearic Islands, about 12 miles long and 8 broad, hilly, woody, and but little cultivated.

Formica (for'mi-ka), the genus to which some of the ants belong.

Formic Acid (for'mik; CH_2O_2), an acid obtained from ants (L. *formica*, an ant), when repeated quantities of them have been infused in boiling water. It is contained in human sweat and urine, in the common nettle and other plants, and may be prepared artificially in various ways. It is a colorless, volatile liquid, with pungent odor, and producing intense irritation on the skin.

Formosa (for-mō'sa), an island in the Chinese Sea, separated from the Chinese prov. of Fokien by a strait about 80 miles wide where narrowest. The island is about 250 miles in length and 70 in average breadth. It is divided by a central range of mountains (rising to 12,000 feet) into a western and eastern part, the former of which (mostly a plain) is occupied by about 500,000 immigrant Chinese, and highly cultivated, producing in abundance corn, rice, sugar, pepper, camphor, oranges, bananas, etc. The eastern part is inhabited mainly by wild tribes of Malayan race, who are gradually disappearing before the Chinese. Northern Formosa is volcanic, and earthquakes occur. Four ports have been open since 1860 to European commerce: Tai-wan (the capital), Tam-sui, Ke-lung, and Takow; and the trade of the island since then has greatly increased. The chief exports are coal, tea, camphor, sugar, indigo, hemp, timber; this island being the principal source of camphor. The imports are cotton and woolen goods and opium. It formerly belonged to China, but was ceded to Japan in 1895, in consequence of the war with China. Japan has had much trouble with the wild tribes and is making vigorous effort to bring them under control.

Formo'sa, an island in the Atlantic, forming one of the Bissagos off the west coast of Africa. See *Bissagos*.

Formula (for'mū-la), a fixed form of words or symbols. In theology it is a formal statement of doctrines; in mathematics, a general theorem, a rule or principle expressed in algebraic symbols. In chemistry it is a mode of expressing the constituents of a compound by means of symbols and letters. Thus water is represented by H_2O, in which H_2 stands for the two proportions of hydrogen and O for the one of oxygen which are combined to produce water. In medicine it signifies a prescription.

Forres (for'es), a burgh of Scotland, county of Elgin, beautifully situated in a finely-wooded country. Forres Castle was the residence of the early Scottish kings, and Shakespere has made this neighborhood the scene of the chief events in *Macbeth*. Pop. 5242.

Forrest (for'est), EDWIN, actor, born in Philadelphia in 1806. He showed an early talent for the stage, and in 1820 made his début at Philadelphia as the hero in Home's play of *Douglas*. In 1826 he appeared before the New York public as *Othello* with signal success. In 1836 he visited England, making a third and last visit in 1845. He continued to act with great success at New York till 1871, when he retired, dying in 1872. His chief characters were *Othello*, *Macbeth*, *Hamlet*, and *Richard III*. His former abode in Philadelphia is now the home of the Philadelphia School of Design for Women, and he established by will a home for aged and infirm actors, near that city.

Forrest, NATHAN BEDFORD, Confederate cavalry commander; born in Tennessee in 1821. He was a slave trader in Memphis, Tennessee, and at the outbreak of the Civil war joined the Confederate Army as a private, becoming a daring commander of cavalry and attaining the rank of lieutenant-general. He was one of the ablest cavalry leaders in the war. His name became notorious in connection with the Fort Pillow Massacre, although he always denied the charge that no quarter was allowed. He died in 1877.

Forster (fors'ter), JOHANN GEORG ADAM, a German traveler, son of Johann Reinhold Forster, was born in 1754. He accompanied his father to Russia and England, and both accompanied Cook in his voyage round the world 1772-75. Subsequently he taught natural history at Cassel, held a professorial chair at Wilna, became librarian to the Elector of Mainz, and died at Paris in 1794. An excellent account of Cook's second voyage round the world was written by him in connection with his father. He also wrote *Essays on Geography, Natural History, Views of the Lower Rhine*, etc.

Forster, JOHANN REINHOLD, a German writer, father of the foregoing, born in 1729. He studied

theology at Halle, and became preacher at Nassenhuben. He chiefly devoted himself, however, to his favorite studies —mathematics, history, geography, etc. After having been engaged on a mission by the Russian government he in 1766 migrated to London, where he supported himself and his son, Johann Georg, partly by teaching. He was finally invited to accompany Captain Cook in his second voyage as naturalist of the expedition. An account of the voyage was published in his son's name (London, 1777). In 1780 he was invited to Halle as professor of natural history, and continued there until his death in 1798.

Forster, JOHN, an English writer, born at Newcastle in 1812. While studying for the bar in London he contributed to the *Examiner* and other periodicals. In 1843 he was called to the bar, but his main interests remained in the field of literature. He became editor of the *Daily News* in 1846, and shortly afterwards of the *Examiner*. In 1847 he published his *Life of Goldsmith*. In 1855 he retired from the editorship of the *Examiner*, having been appointed the year previous secretary to the Lunacy Commission, of which he became in 1861 a commissioner. During this period he devoted himself to historical studies, the result of which appeared in his *Arrest of the Five Members*, *Debates on the Grand Remonstrance*, and *Life of Sir John Eliot*. He also published biographies of Landor and Dickens, but died in 1876, before completing his *Life of Swift*.

Forster, WILLIAM EDWARD, an English statesman, born at Bradpole, Dorset, in 1818, the son of an eminent minister of the Society of Friends. He entered into the woolen trade at Bradford. In 1850 he married the eldest daughter of Dr. Arnold, of Rugby. He was returned to Parliament for Bradford in 1861; became successively under-secretary for the colonies, vice-president of the Education Committee and a member of the cabinet. He had charge of the Education Bill of 1870 and the Ballot Bill of 1872. In 1875, the Liberals having just returned to power, Mr. Forster accepted the post of chief secretary for Ireland at a time when that country was distracted by agrarian and political tumults. The suppression of the Land League and the arrest of Mr. Parnell and the more violent agitators was carried out by Mr. Forster, but on the government resolving to change its policy and release the Parnellites Mr. Forster resigned (1882). After this he was often found voting in opposition to the government, particularly in matters of foreign and imperial policy. He died in 1886.

Forsyth (for-sith'), WILLIAM, an English lawyer and writer, born in 1812. After a brilliant career at Trinity College, Cambridge, he studied law, was called to the bar in 1839, and became a queen's counsel in 1859. He represented the borough of Marylebone in the House of Commons in 1874-80. Besides legal works he wrote *Hortensius, or the Duty and Office of an Advocate; History of Trial by Jury; Napoleon at St. Helena and Sir Hudson Lowe; Life of Cicero; Novels and Novelists of the Eighteenth Century; Hannibal in Italy*, a drama, etc.; and contributed to periodicals. Died in 1899.

Fort (fôrt), a small fortified place surrounded with a ditch, rampart, and parapet, for the purpose of defending a pass, river, road, harbor, etc. Forts are made of different forms and extent according to the exigencies of the case. See *Fortification*.

Fort Collins, a city, capital of Larimer County, Colorado, on Cache la Poudre Creek, 74 miles N. of Denver. It is the seat of the Colorado Agricultural College and of a government experiment station. Nearby are large cattle and sheep ranges, and it has a large beet-sugar factory. Pop. 10,000.

Fort de France, or FORT ROYAL, a town and seaport of the French West Indies, island of Martinique, of which it is the capital. It was almost completely destroyed by a cyclone in 1891. Pop. about 14,000.

Fort Dodge, a city, capital of Webster County, Iowa, on the Des Moines River, 85 miles N. W. of Des Moines. Nearby are coal mines and beds of gypsum and clay. The manufactures include gypsum products, clay wares, shoes, clothing. It is an important grain market. Pop. 15,543.

Fort Edward, a village and township in Washington Co., N. Y., on the Hudson. It was a place of much importance in the French and Indian wars and was repeatedly occupied by opposing forces in the Revolution. General Dieskau (q. v.), in command of the French army, attacked the fort in 1755, but was defeated and captured. It was from here that Burgoyne (q. v.) began his march to Albany, August 14, 1777. See *Saratoga*.

Forth (fôrth), a river of Central Scotland, about 65 miles long.

Forth Bridge, the great railway viaduct which crosses the Firth of Forth at Queens-

ferry, here about 4000 feet wide at low water. The small island of Inchgarvie is used as the central support of the two chief spans, which are 1710 feet wide each. These spans are each made up of two cantilevers extending towards each other from the opposite sides and connected by a girder, the cantilevers being 343 feet deep where they rest on the supporting piers and 40 feet at the free ends, and projecting 680 feet, while the central connecting girder is 350 feet in length. There are other two spans of 680 feet each, fifteen of 168 feet each, and seven small arches totaling about 400 feet. Including piers there is about a mile of main spans and over half a mile of viaduct approach. The bridge has a clear headway of 157 feet above high water and carries two lines of rails. It was built 1882–89, the contract price being $8,000,000.

Section through Line of Fortifications.

Fortification (for-ti-fi-kā'shun), the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked; and more particularly, the science of strengthening positions so that they may be held against the assault of troops supported by artillery. Fortifications are usually divided into permanent and temporary. Permanent fortifications are works required to remain effective for any length of time, for the purpose of defending important positions and cities, dockyards, arsenals, etc. Temporary fortifications are such as are designed merely to throw temporary obstacles in the way of the enemy, as fieldworks, etc. The former are constructed on the principle that each part must by its fire support and be supported by some other part; that the works must protect the defenders from the enemy's fire as well as possible, and that the fire of the fortress must completely sweep all parts of the ground in front of the fortified lines. The more important details of a regular fortification may be briefly described as under: Around the place to be defended is raised a mound or bank of earth called a rampart, on the upper surface of which, the *terre-pleine* (*a*), the troops and cannon are placed. The terre-pleine is protected from the enemy's fire by a breastwork or *parapet* (*b*), about 8 feet high, sometimes pierced at certain intervals with *embrasures* through which the guns are fired. Beyond the rampart is the *ditch*, usually about 12 feet in depth, but varying greatly in width. The ditch is sometimes filled with water; in other cases it is dry. The *scarp* or *escarp* (*c*) is the inner wall of the ditch, and it is faced with mason-work or hurdles, sods, etc. (the *revetement*) to retain the earth of the rampart in its place. The *counterscarp* (*d*) is the opposite or outer wall of the ditch. From the top of the counterscarp outwards is a space about 30 feet wide (the *covered-way*, *e*) protected by a parapet, the long superior outward slope of which towards the open ground forms the *glacis*. The use of the covered-way is to allow the troops to be drawn up on it unseen by the besiegers for the purpose of making a sortie, it also enables the defenders to keep up a closer fire on the attacking forces. The slope of the glacis is so constructed as to bring the assailants in the direct line of fire from the artillery on the ramparts. In the sectional cut A is towards the interior of the fort, B towards the open country. At certain intervals there are often bastions or projecting works at salient angles, commanding by their fire the *curtain* or straight portion of the fortified line between them. The use of the bastion has given name to what is called the *bastionary* system of fortification, which has in modern times largely given way to what is known as the *polygonal* or German system, which is considered to have various advantages in relation to the powerful artillery of the present day. The polygonal system has also been called the *caponier* system, from the use of powerful casemated caponiers constructed across the ditches and serving instead of bastions for their defense. The general plan of the works is polygonal, with the ramparts placed on the sides of the polygon. The connecting line of fortifications, surrounding a place is called the fortified *enceinte*, and the works in a regular fortress form a very complicated whole, including works to which such names as *ravelins*, *demi-*

lunes, etc., are given. The fortified enceinte immediately surrounding a place is not now considered a sufficient defense, on account mainly of the long range of modern cannon. Hence it is usual to surround a fortress with a line of detached forts at some distance from the enceinte, or there may be more than one such line of advanced works. Fortifications intended to ward off attacks by sea have their sea-faces now commonly protected by plates of iron or steel. Scientific fortification may be said to commence with the great French engineer Vauban, who served under Louis XIV. He developed the bastioned system, which, as improved by Cormontaigne and others, is still the prevailing type of French fortification.

Field Fortifications vary much according to the time allowed for construction and during which they may prove useful. Amongst works of this nature are the *redan*, which consists of two parapets, with a ditch in front, forming an angle facing the enemy; the *lunette*, which is a redan with short flanks; the *redoubt*, a closed work with a ditch and parapet all round. As none of those works has a flanking fire in itself, they have to be disposed so that they flank each other within rifle range. To do this effectually, and to strengthen the whole line, the plan generally adopted is to form an intrenched camp by a line of square redoubts, flanking each other, and also a line of simple redans in front of the intervals of the redoubts. When the time is not sufficient to throw up such works, simple forms of intrenchments, such as shelter trenches, are used to shelter troops or oppose the enemy's advance. A very shallow trench, with the earth thrown to the front, so as to afford shelter to one man lying in it, may be made in somewhat less than half an hour; more elaborate forms in about one hour. So that by placing a man at every 4 feet, active troops can make good shelter for themselves in an hour. To impede the enemy's advance an abattis of felled trees may be used, also wire entanglements, chevaux-de-frise, etc.

Fort Madison, a city, capital of Lee Co., Iowa, on the Mississippi River, 24 miles above Keokuk. It has a state penitentiary, iron, lumber, and paper mills, etc. Pop. 8900.

Fortress Monroe, Old Point Comfort, Virginia, defending, with Fort Wool, Hampton Roads, Norfolk, and the Gosport navy yard. It contains barracks, a school of artillery, and arsenal. It is an irregular hexagon, surrounded by a tidewater ditch eight feet deep, and covers eighty acres.

Fort Scott, a city, county seat of Bourbon county, Kansas, 99 miles S. of Kansas City. It has an active business in flour, pottery and iron. Here is located the Kansas Normal College. Pop. 11,793.

Fort Smith, county seat of Sebastian county, Arkansas, at the confluence of the Arkansas and Potean rivers, served by five railroads. It is in the heart of rich coal and gas fields, and has many industries, including wagon and furniture factories, wood-working establishments, brick factories, ironworks, etc. Pop. 30,000.

Fort Stanwix, a fort on the Mohawk River, on the site of Rome, N. Y., erected by Brigadier John Stanwix in 1758. It was besieged by the British in 1777. See *Johnson, Sir William; St. Leger.*

Fort Sumter, a fort on the entrance to Charleston Harbor, South Carolina. At the opening of the War of Secession it was taken by the Confederates from the small body of Federal troops by whom it was garrisoned (14 April, 1861). It repulsed an attack of nine iron-clads on 7 April, 1863, and was heavily bombarded in August of the same year, but maintained its defense till the final evacuation of Charleston, Feb. 18, 1865. It has been rebuilt on a modified plan.

Fortuna (for-tū'na), the Roman goddess of success, corresponding to the Greek *Tychē*. She is generally delineated with a rudder, emblem of her guiding power; or, later, with a bandage over her eyes and a scepter in her hand, and sitting or standing on a wheel or globe.

Fortunate Islands, an old name of the Canaries.

Fortunatus (for-tū-nā'tus), the hero of an old popular legend. He obtained a wishing-cap and inexhaustible purse of gold, which finally ruined him and his sons. The first printed edition of the story appeared in Germany in 1509, but in various forms it has appeared in most of the languages of Europe.

Fortunatus, a Latin poet, born in Northern Italy about 503 A.D.; Bishop of Poitiers in 597; died about 600. His works were numerous, but he is remembered only by his hymns, one of which (*Vexilla regis prodeunt*) was adopted by the church, and is well known in the modern version of J. M. Neale ('The royal banners forward go,' etc.).

Fortuny (for-tö'nē), MARIANO, a Spanish painter, born near Barcelona in 1839. He settled at Rome, where he became the center of a school of artists in revolt against overstudy of the 'masters.' In 1866 he went to Paris. Among his best known works are *Spanish Marriage*, *Fantasia at Morocco*, *The Academicians at Arcadia*, *The Seashore at Portici*. Died 1874.

Fort Wayne, a flourishing city of Indiana, capital of Allen Co., situated at the junction of the St. Mary's and St. Joseph's Rivers, which here unite to form the Maumee. It has extensive railroad shops, car-wheel works, hosiery mills, and electrical machinery works, with many other industries. Here are Concordia College and other educational institutions. Fort Wayne derives its name from a fort erected here in 1794 by General Anthony Wayne. Pop. 78,547.

Fort William, a port and summer resort of Ontario, Canada, on Thunder Bay, at head of navigation on Lake Superior.

Fort William Henry, a fort in the modern town of Caldwell, N. Y., at the head of Lake George, erected by Sir William Johnson (q. v.) in 1755. In August, 1757, it was attacked by Montcalm (q. v.), leading a force of 8000, including 2000 Indians; and Colonel Munro, commanding the English forces, was compelled to surrender.

Fort Worth, a city, county seat of Tarrant Co., Texas, 160 miles N. of Austin, with 17 railroad outlets. Here are numerous industries, including grain elevators, and flour mills, packing houses, furniture-making, woodworking, etc. It is the seat of Polytechnic College, Texas Christian University, and other institutions. Pop. 73,312.

Forum (fō'rum), among the Romans, any open place where the markets and courts of justice were held. There were a number of such places in Rome, by far the most celebrated being the great Roman forum (*Forum Romānum*) between Mount Palatine and the Capitoline Hill. This place, once adorned with the most beautiful statues and buildings, had become almost a waste known as the *Campo Vaccino*, or cattle-field, but of late years the government has made clearances and excavations and taken charge of the valuable relics which are still left.

Foscari (fos'kä-rē), FRANCESCO, Doge of Venice, born about 1372, elected in 1423. The whole period in which he governed the republic was one of war and tumult, campaigns being undertaken against the Turks, the Visconte of Milan, and others, in which Venice was mostly victorious, extending her dominion to the Adda. But in his private life the doge was less fortunate. Three of his sons died in the service of the republic, and the fourth, Jacopo, being accused of receiving bribes from foreign princes, was condemned to torture and exiled to Crete, where he died. When eighty-five years of age Foscari was deposed from the dogeship at the instigation of a rival, Jacopo Loredano, and died a few days after, November 1, 1457. On the story of Jacopo Foscari is founded Byron's tragedy of *The Two Foscari*.

Foscolo (fos'ko-lō), UGO, an Italian poet and prose writer, born about 1776, and educated at the University of Padua. Before the age of twenty he produced his tragedy *Il Tieste* ('Thyestes'), which was received with applause. His next work of importance was a romance somewhat in the style of Goethe's *Werther*, called *Ultime Lettere di Jacopo Ortis* ('Last Letters of Jacopo Ortis'). He then procured a commission in the army (First Italian Legion). After some military experiences under Masséna at Genoa and elsewhere, in 1805, he retired and wrote *I Sepolcri*, one of the finest of his poems. He was subsequently appointed to a professorship at Pavia, of which Napoleon, displeased at his freedom of speech, soon deprived him. In 1812 he produced his tragedy of *Ajax*, and soon after that of *Riccarda*. On the fall of Napoleon, Foscolo, who was obnoxious to the Austrians, retired to Switzerland; but finally, in 1815, went to London, where he met with a most favorable reception, and where he died in 1827. Besides the works already mentioned, his critical writings, *Essays on Petrarch* and *Discourses* on the texts of Dante and of Machiavelli's *Il Principe*, are well known.

Foss, or FOSSE (French *fosse*, Latin *fossa*, a ditch), in fortification, a trench or ditch, often full of water, below the rampart of a fortified place, or a post that is to be defended. See *Fortification*.

Fossano (fos-sä'nō), a town in North Italy, on the Stura, 13 miles northeast of Cuneo. It is surrounded by old walls and defended by a castle. It is a bishop's see and has a cathedral. Pop. of commune, 18,175.

Fosse Way, or FOSSE ROAD, one of the great Roman roads from Cornwall by Bath, Coventry, and Leicester, to Lincoln. It is still traceable nearly all the way.

Fossil (fos'il), a term for the petrified forms of plants and animals which occur in the strata that compose the surface of our globe. Most of these fossil species, many of the genera, and some of the families are extinct. When these remains are only partially fossilized, and occur in superficial or recent deposits, the term *subfossil* is employed. See *Geology* and *Palæontology*.

Fossil Footprints, the footmarks or imprints left at very remote periods by the feet of various animals on the wet clay or sand of sea-beaches or similar localities, and which are now found at various levels in the solid strata of the earth. The footprints in the Silurian and other very antique rocks are mostly those produced by the claws of crustaceans. In the Triassic rocks of Connecticut, numerous footprints have been found, over forty species being represented.

Fossil Forests. The coal measures present abundant indications of ancient forests, usually in the form of the roots of the trees from which the coal was formed. Several such have been uncovered, as in the coalfields of Nova Scotia, where Lyell found the remains of trees 6 to 8 feet high, and one tree about 25 feet high and 4 feet in diameter. At St. Etienne, near Lyons, France, the remains of a fossil forest have been found in an upright position, and in a colliery near Wolverhampton, England, in a space about one-fourth of an acre, have been found the fossilized stumps of 73 trees, with roots attached, and with the broken-off trunks lying prostrate, one of them 30 feet long and all of them turned into coal. Much more recent are the remains of forests lying under beds of peat, 'submerged forests,' as they are called, found in various parts of Europe and America. Especially interesting are the collections of fossilized tree trunks, or 'petrified forests,' found in the surface in various parts of the earth, the most striking examples being in the western part of the United States. A remarkable group of such trees, some of them 12 feet in diameter, exists in Napa County, California, and another in Yellowstone Park, in which the trees are still erect, though converted into stone. An extraordinary forest of such trees has been found in Arizona, lying over a wide space of ground, some of them 6 feet in diameter and perfectly preserved. These trees are rather mineralized than fossilized. They are found in volcanic regions and are supposed to be due to the action of hot water, which carried off the organic material and deposited dissolved silica in its place. In some instances the wood has been converted into solid jasper or has been changed into opal or agate, or filled with chalcedony or crystallized quarts, with beautifully variegated colors.

Fossombrone (fos-som-brō'nā), a town of Central Italy, 38 miles W. N. W. of Ancona, on the Metauro, with a fine cathedral. Pop. (commune) 10,847.

Foster (fos'tėr), BIRKET, an English artist, born at North Shields in 1812. He learned wood-engraving under Landells, and in early life became a draughtsman. He soon achieved a high reputation as a book illustrator, and illustrated the works of Goldsmith, Scott, Longfellow, Beattie, etc. His landscape drawings on wood are of great excellence. He afterwards devoted himself to water-color painting, in which his reproductions of rustic life were very successful. Died in 1899.

Foster, JOHN, an English essayist, was born in Yorkshire in 1770. After a short trial of the weaving trade he studied for the Baptist ministry, obtained a charge at Newcastle-on-Tyne, but his preaching being unsuccessful, he took to literature, contributing extensively to the *Eclectic Review*. In 1805 he published four essays, very celebrated in their time, which established his fame as an author. In 1819 the celebrated *Essay on the Evils of Popular Ignorance* appeared. He died in 1843.

Foster, JOHN WATSON, diplomatist, born in Pike Co., Indiana, in 1836. He served with distinction in the Civil War, and was afterwards editor of the Evansville (Ind.) *Daily Journal*. His diplomatic career began in 1873, when he was sent as Minister to Mexico. Thence he went to Russia in 1880, and to Spain in 1883, and in 1891 was engaged in negotiating reciprocity treaties with Spain, Germany and Brazil. He was Secretary of State under President Harrison in 1892-93. He was subsequently engaged in various diplomatic services, the latest being as a member of the Alaska Boundary Tribunal of 1903, and as the representative of China to the Second Hague Conference, 1907.

Foster, STEPHEN COLLINS, song-writer, born at Pittsburgh, Pennsylvania, in 1826; died in 1864. He was very prolific in musical composition, writing the words and composing the music of over 125 popular songs and melodies. Among them are the well-known airs, *My Old Kentucky Home; Old Folks at Home; Willie, We Have Missed You; Old Black Joe; Uncle Ned*, etc.

Fostoria (fos-tō'ri-a), a city of Ohio, lies in Seneca, Hancock, and Wood Counties, 12 miles N. W. of Tiffin. It is a considerable railroad and manufacturing center, having five railroads. Natural gas is abundant, and is used for manufacturing and domestic purposes, flour, glass, barrels, etc., being produced. Here is the Ohio Normal University. Pop. 9597.

Fotheringhay (fo-ther-ing'hay), a village of England 27 miles northeast of Northampton. In its castle Mary Queen of Scots was beheaded in 1587.

Foucault (fō-kō), JEAN BERNARD LÉON, a French physicist, born 1819; died 1868. His name is especially connected with a celebrated pendulum experiment employed as a method of showing the rotation of the earth on its axis, by observing a vibrating pendulum. He also rendered services to optics, electric lighting, photography, etc.

Fouché (fō-shā), JOSEPH, Duke of Otranto, a minister of Napoleon I, was born in 1763. He was at first educated for the clergy, but having adopted the principles of the revolution he became an advocate and was elected a member of the National Convention in 1792. Here he voted for the death of the king, and was implicated, at least nominally, in the atrocities of the period. On the fall of Robespierre (1794), Fouché, who had for some time tended towards the moderate party, managed to make friends with Barras, and was rewarded for his betrayal by the ambassadorship to Milan. He was afterwards appointed ambassador to Holland, but ultimately recalled to Paris and made minister of police. Here his peculiar talents had full scope; and although he was twice dismissed by Napoleon, who did not altogether trust him, he always recovered his post, was loaded with riches, and made Duke of Otranto. He was minister of police at Napoleon's final abdication and played an important part in the arrangements. He remained in office under Louis XVIII for a time, but the dislike of the royalist party at length forced him to resign (1815). He went as ambassador to Dresden, but afterwards retired to Prague, and latterly to Trieste, where he died in 1820.

Fougasse (fō-gās'), military, a little mine in the form of a well, 8 or 10 feet wide and 10 or 12 deep, dug under some work, fortification, or post, charged with powder, or powder and shells, and covered with stones or earth, for destroying the works by explosion.

Fougères (fō-shār), a town of N. E. France, dep. Ille-et-Vilaine, on a height, 28 miles N. E. of Rennes. It was once fortified, so as to be considered one of the keys of Brittany, but is now open, well built, and has manufacturers of flannels, sailcloth, sacking, etc. Pop. (1906) 21,847.

Foula (fou'la), an island belonging to the Shetland group, but lying some 20 miles to the west. It rises from the sea in lofty cliffs, which swarm with sea-fowl.

Foulahs. See *Fellatahs.*

Foundation (foun-dā'shun), that part of a building which is underground, or the portion of the ground on which walls, piers, etc., rest. Foundations are usually made by providing a hard, impermeable base for the masonry by methods which vary according to the position and soil. Where there is rock beneath, nothing more is needed than a dressing for the surface. Submerged foundations, such as those needed for breakwaters, bridges, etc., constitute special subjects for engineering science.

Foundation, a donation or legacy, in money or lands, for the maintenance or support of some useful charitable institution, as an hospital, a college, a school, etc.

Foundation-stone, a stone of a public building laid in public with some ceremony. It has no necessary connection with the foundation of the building. Also called corner-stone.

Founding. See *Casting.*

Foundling Hospitals (found'ling), institutions for receiving children abandoned by their parents and found by strangers. Among such institutions are that of Paris, instituted in 1670, and that of London in 1739. The latter was originally a hospital for all exposed children; but the enormous increase in abandonments caused the hospital to be changed in 1760 to one for poor, illegitimate children whose mothers are known. The objection that foundling hospitals contribute to the corruption of morals is the strongest which can be urged against such institutions, and is not easily answered.

Foundry (foun'dri), a place where metal is melted and cast into the forms required in construction or decoration. Iron, brass, bronze, and type founding are special forms of the art. See *Casting.*

Fount, or FONT, among printers, etc., a quantity of types, in proportions sorted for use, that includes ordinary letters, large and small capitals, single letters, double letters, points, commas, lines, numerals, etc.; as a fount of pica, bourgeois, etc. A fount of 100,000 characters, which is a common fount, would contain 5000 types of *a*, 3000 of *c*, 11,000 of *e*, 6000 of *i*, 3000 of *m*, and about 30 or 40 of *k*, *x*, *y*, and *z*. But this is to be understood only of the ordinary types, capitals having other proportions, which we need not here enumerate.

Fountain (foun'tan), a contrivance by which water is made to spout from an artificial channel, and often to rise up to a great height in a jet or jets. There are various kinds of artificial fountains, but in those of an ornamental character the water is usually made to rise in a jet by the pressure or weight of a head of water situated some distance above the orifice of issue, in which case the water will rise nearly to the same height as the head. In some cities the public fountains form a feature on the streets. Rome, in particular, is noted for its fountains. At Paris, also, the fountains of the Place de la Concorde, the Tuileries, and at Versailles, are splendid structures.

Fouqué (fö-kā), FRIEDRICH HEINRICH KARL, Baron de la Motte, a German poet and novelist, born in 1777, grandson of the Fouqué the subject of the next article. He served as lieutenant of the Prussian guards in the campaign of 1792, thereafter lived in rural retirement, but again returned to the army, and was present at the most important battles in the campaign of 1813. He died at Berlin in 1843. As a writer his work is marked by fantastic unreality and extravagance of conception. Several of his tales, *Der Zauberring* ('Magic Ring'), *Undine*, and *Aslauga's Ritter* ('Aslauga's Knight'), have been very popular. A translation of the latter was made by Carlyle.

Fouqué, HEINRICH AUGUST, Baron de la Motte, a distinguished Prussian general in the Seven Years' war, born in 1698; died in 1774. He was descended from an old Norman family which had fled on account of religious persecutions to The Hague. Fouqué's *Mémoires*, containing his correspondence with Frederick the Great, are highly interesting.

Fouquier-Tinville (fö-ki-ā-tan-vēl), ANTOINE QUENTIN, notorious for his ferocious cruelty in the first French revolution, was born in 1747. He was an attorney by profession, and having attracted the attention of Robespierre, was appointed public accuser before the revolutionary tribunal. His thirst for blood seems to have been increased by gratification, until it became a real insanity. He proposed the execution of Robespierre and all the members of the revolutionary tribunal in 1794, but was himself arrested, and died under the guillotine, in a cowardly manner, in 1795.

Fourchambault (för-shan-bō), a town of France, dep. Nièvre, on the Loire. It has extensive iron-smelting furnaces and forges. Pop. (1906) 4591.

Fourcroy (för-krwä), ANTOINE FRANÇOIS DE, a French chemist, born in 1755. Having adopted the profession of medicine, he applied himself closely to the sciences connected with it, and especially to chemistry. In 1784 he was made professor of chemistry at the Jardin du Roi; and the next year he was chosen a member of the Academy of Sciences. At this period he became associated with Lavoisier, Guyton-Morveau, and Berthollet in researches which led to vast improvements and discoveries in chemistry. When the revolution took place he was chosen a deputy from Paris to the national convention, but did not take his seat in that assembly till after the fall of Robespierre. In September, 1794, he became a member of the committee of public safety. In December, 1799, Bonaparte gave him a place in the council of state, in the section of the interior, in which place he drew up a plan for a system of public instruction, which, with some alteration, was adopted. He died in 1809. His works are numerous. We may mention his *Système des Connaissances chimiques* and *Philosophie chimique*.

Fourier (fö-ri-ā), FRANÇOIS MARIE CHARLES, a French socialist and founder of the system named after him, was born in 1772 at Besançon. He studied in the college of his native town, and subsequently at Rouen and Lyons occupied subordinate situations in mercantile houses. In the last-mentioned town he entered into business on his own account, but lost all his money from the tumults of war and was forced to enlist in the revolutionary army. Discharged in 1795 on account of ill health, he returned to commerce, filling quite subordinate situations, till he died in 1837. He wrote his books in his leisure hours and published them out of his [illegible] savings. His first book, *Théorie des Quatre Mouvements et des Destinées Générales*,

was published in 1808; the *Traité de l'Association Domestique Agricole*, his most important work, in 1822; but it was not till the last years of his life that they attracted any notice. In his social system Fourier holds that the operations of industry should be carried on by *Phalansteries*, or associations of 1800 members combining their labor on a district of about a square league in extent, under the control of governors elected by each community. In the distribution a certain minimum is first assigned for the subsistence of every member of the society, whether capable or not of labor. The remainder of the produce is shared in certain proportions to be previously determined among the three elements, labor, capital, and talent. The capital of the community may be owned in unequal shares by different members, who would in that case receive, as in any other joint-stock concern, proportional dividends. The claim of each person on the share of the produce apportioned to talent is estimated by the grade which the individual occupies in the several groups of laborers to which he or she belongs, these grades being in every case conferred by the voice of his or her companions. The remuneration received would not of necessity be expended in common. Separate rooms or sets of rooms would be set aside for those who applied for them, no other system of living together being contemplated than such as would effect a saving of labor in building and the processes of domestic life, and reducing the enormous portion of the produce of industry at present carried off by middlemen and distributing traders to the narrowest possible margin.

Fourier, Jean Baptiste Joseph, a French mathematician, born at Auxerre 1768, was educated in the military school there, and after holding an appointment for a short time in the Polytechnic School followed Bonaparte to Egypt. Here he performed important political service, and was likewise secretary of the Institute of Egypt. After his return he was, in 1802, appointed prefect of the department of Isère. On Napoleon's return from Elba Fourier issued a royalist proclamation, but was nevertheless appointed prefect of the Rhone, though soon after deprived of the office. He now established his residence in Paris, lived entirely devoted to study, and was in 1815 admitted a member of the Academy of Sciences, and at a later period appointed secretary for life. He died in 1830. Amongst his principal works are the *Théorie Analytique de la Chaleur* (1822), and *Analyse des Equations Determinées*, published in 1831 after his death.

Fourierism. See *Fourier (François)*.

Fourier Series, infinite series of special type, named after Fourier, who first showed their importance. They proceed according to sines and cosines of multiples of a variable, the various multiples being in the ratio of the natural numbers; and are used for the representation of a function of the variable for values of the variable which lie between prescribed finite limits.

In the discussion of all complex periodic phenomena, such as tidal flow and ebb, earthquake frequency, the penetration of solar heat into the crust of the earth, etc., the true method of attack is along the lines of the Fourier analysis.

Fourth (fōrth), in music, a distance comprising three diatonic intervals, or two tones and a half. Three full tones compose a tritone or fourth redundant. The diminished fourth consists of a whole tone and two semi-tones.

Foveaux Strait (fō'vō), the strait between the South Island of New Zealand and Stewart's Island.

Fowey (fō'i), a seaport of England in Cornwall, near the mouth of the river Fowey, formerly one of the chief seaports of England. It carries on an extensive pilchard fishery. Pop. 2258.

Fowl (foul), a word originally synonymous with *bird*, now used in a stricter sense to designate the birds of the genus *Gallus*, of which the common domestic fowl (cock and hen) is a familiar example. The general form and characters of the bill, feet, etc., agree with those of the pheasants, but the crown of the head is generally naked and furnished with a fleshy comb, the base of the lower mandibles also bearing fleshy lobes or wattles—characters which are most conspicuous in the males. The legs of the male are furnished with spurs which are much used in conflict, the cocks being very pugnacious and unable to suffer the presence of a rival. In the center of the cock's tail are two long feathers, which fall backwards in a graceful arch and add great beauty to the whole aspect of the fowl. Except in the pure white breeds the plumage of the cock is always more splendid than that of the hen. All the species are natives of the East Indies and the Malayan Archipelago. Some have thought that the *bankiva jungle fowl*, a native of Java, is the original stock of of the domesticated poultry. Fowls were introduced into China about 1400 B. C., and were common in ancient Greece, being mentioned by Aristophanes and others.

Fowling, the taking of wild birds in numbers, either for food or for their feathers. It includes a variety of methods, such as the catching of small birds by nets; the taking of ducks and other water-fowl in decoys; the lowering of persons over the brink of precipices to seize the birds that lodge in their hollows and shelves, etc.

Fowling Piece, a light kind of gun for shooting birds of various kinds.

Fox (foks), an animal of the genus *Vulpes*, closely allied to the dog, with a straight, bushy tail, elongated pupils, and erect ears. Foxes are natives of almost every quarter of the globe, and are everywhere among the most sagacious and wily of all beasts of prey. very voracious, devouring birds and small quadrupeds, and committing ravages not only on animals, but on fruits, honey, eggs, etc. The common fox of Europe (*Vulpes vulgāris*) and Asia is well known. Among other species there are the Arctic fox (*V. lagōpus*), celebrated for its glossy white winter fur; the *black fox* (*V. argentātus*), similar to the common fox, but distinguishable by its rich, shining black fur, a native of the northern parts of Asia and America; the *gray fox* (*Urocyon Virginiānus*) has a thick tail containing at its tip a tuft of stiff hairs, common through the northern parts of America; the *red fox* of America (*V. fulvus*), generally of a pale-yellow hue; the *crossed fox* (*V. Pennsylvanicus* or *decussātus*), fur a sort of gray, muzzle and lower parts of body black, a dark cross on the shoulders; the *swift fox* (*V. velox*), an inhabitant of the plains which lie at the base of the Rocky Mountains. The fox resides in burrows, which it scoops out of the earth by its strong digging paws, taking advantage of every peculiarity of the ground, and contriving, whenever it is possible, to wind its subterranean way among the roots of large trees or between heavy stones. In these 'earths,' as the burrows are known in sportsmen's phraseology, the female fox produces and nurtures her young, which are odd little snub-nosed creatures, resembling almost any animal rather than a fox. The color of the common fox is a reddish fawn, intermixed with black and white hairs. The hair is long and thick, being doubly thick during the colder months of the year, so that the fur of a fox which is killed in the winter is more valuable than if it had been slain in the hot months. The tail, which is technically termed the 'brush,' is remarkably bushy, and partakes of the tints which predominate over the body, except at the tip, which is white. The height of this animal is about a foot, and its length about two feet and a half.

Fox, Charles James, an eminent English statesman, born in 1749, the second son of Henry, first Lord Holland. He was sent to Eton, whence he removed to Hertford College, Oxford. His father procured him a seat for the borough of Midhurst in 1768, before he was of legal age, and in 1770 he was appointed one of the lords of the admiralty, which situation he resigned in 1772, and was appointed a commissioner of the treasury. After being a supporter of the administration for six years, a quarrel with Lord North threw Fox into the ranks of the Whig opposition, where, along with Burke and others, he steadily assailed the government, especially on the score of its American policy. In 1780 he was elected member for Westminster, and on the defeat of the administration of Lord North, and the accession of that of the Marquis of Rockingham, he obtained the office of secretary of state for foreign affairs (1782). But the death of the Marquis of Rockingham suddenly divided the party; and when the Earl of Shelburne became first lord of the treasury Fox retired. Soon after a union took place between his friends and those of Lord North, known as *the coalition ministry*, which was overthrown by Fox's famous East India Bill (1783). At the ensuing election nearly seventy of his friends lost their seats; but though Pitt had a decided majority, Fox still headed a very strong opposition, and for some years political questions were contested on both sides of the house with a great display of talent. He took an active part against Warren Hastings, supported the efforts of Wilberforce against the slave trade, and moved the repeal of the Test and Corporation Acts. He welcomed the breaking out of the French revolution, and his views on this subject led to a memorable break between him and his old friend Burke. Fox firmly opposed the principle on which the war against France was begun, and strenuously argued for peace on every occasion; but eventually, on becoming secretary for foreign affairs in 1806, acquiesced ... the propriety of the war. His health, which had been impaired by his loose manner of living, now began rapidly to decline, and he died the same year a few months after the death of Pitt, his great rival. As a powerful and purely argumentative orator he was of the very first class; although as to eloquence and brilliancy he perhaps yielded to Pitt, Burke, and Sheridan; nor were his voice and manner prepossessing, al-

though highly forcible. He was of an amiable nature, and a sincere friend to all broad and liberal principles of government. His *History of the Early Part of the Reign of James II* was published posthumously.

Fox, GEORGE, the founder of the Society of Friends, or Quakers, was born at Drayton, in Leicestershire, in 1624, his father being a weaver. He was educated religiously, and at the age of nineteen persuaded himself that he had received a divine command to forsake everything else and devote himself wholly to religion. He accordingly forsook his relations, equipped himself in a leathern doublet, and wandered from place to place, supporting himself as he could. During this itinerant life he fasted much, sometimes sitting the whole day in a retired spot reading the Bible. In 1648 he commenced to preach publicly at Manchester, about which time he also adopted the peculiar language and manners of Quakerism. At Derby his followers were first denominated *Quakers*, in consequence of their trembling mode of delivery and calls on the magistracy to tremble before the Lord. In 1655 he was sent a prisoner to Cromwell, who, having ascertained the pacific tendency of his doctrines, had him set at liberty. He was, however, treated with great severity by the country magistracy and the sterner Puritans, who disliked the mysticism and want of firm doctrines in his preaching. In 1666 he set about forming the people who had followed his doctrines into a formal and united society. In 1669 he married the widow of Judge Fell, and soon after went to America, where he remained two years, which he employed in making proselytes. On his return he was imprisoned in Worcester jail for over a year. He died in 1691.

Fox, JOHN (WILLIAM), JR., an American novelist (1863-1919), born in Kentucky, author of many mountain tales, including *Little Shepherd of Kingdom Come, Christmas Eve on Lonesome, Hell for Sartain, Blue Grass and Rhododendron, The Trail of the Lonesome Pine, The Heart of the Hills*, etc.

Fox, MARGARET, spiritualist, was born at Bath, Canada, in 1836; died in 1893. The cult of spiritualism began with her and her sisters, Leah and Catharine. While living in their father's house, at Hydeville, New York, in 1847-48, a series of mysterious rappings took place which were claimed to be the work of spirits of the dead. From this modern spiritualism, which has now grown so prominent, arose. The sisters gave séances for many years, and Margaret is said to have been privately married to Dr. Kane, the Arctic explorer, in 1856.

Fox-bats, or FLYING FOXES, a name given to the fruit-eating bats of the family Pteropidæ, including some of the largest of the bat tribe, one species, the *Pteropus edulis* or kalong, attaining a length of from 4 to 5 feet from the tip of one wing to the tip of the other. They inhabit Australia, Java, Sumatra, Borneo, etc., as well as the continents of Asia and Africa.

Foxe, JOHN, an English church historian, born in 1517. He studied at Oxford, and was elected a fellow of Magdalen in 1543, from which he was expelled two years later on a charge of heresy. In the reign of Edward VI he was restored to his fellowship, but during Mary's reign again went abroad, to Basel. On the accession of Elizabeth he returned to his native country, and was received in the most friendly manner by his former pupil, the Duke of Norfolk, who settled a pension on him. Secretary Cecil also obtained for him a prebend in the church of Salisbury; and he might have received much higher preferment if he would have subscribed to the articles enforced by the ecclesiastical commissioners. He died in 1587. His principal work is the *History of the Acts and Monuments of the Church*, commonly called *Foxe's Book of Martyrs*, first printed in 1563, in one vol. folio.

Fox'glove, a genus of plants, *Digitālis purpurĕa*, natural order Scrophulariaceæ. It grows on banks, pastures, etc., in hilly and rocky countries in Europe, Asia, and the Canary Islands. Its flowers are campanulate, and somewhat resembling the finger of a glove. It is one of the most stately and beautiful of the herbaceous plants, and one that has great reputation as a medicinal plant, being employed as a sedative, narcotic, and diuretic in diseases of the heart and in dropsy. Its medicinal properties are due to the glucoside known as digitalin. A decoction or infusion of the leaves is what is generally used. The flowers are usually purple, but sometimes white. Several species are grown in gardens, such as *D. grandiflōra* and *D. lutĕa*, with yellow flowers, and *D. ferruginĕa* with brown.

Foxhound, a hound for chasing foxes, a variety of hound in which are combined, in the highest degree of excellence, fleetness, strength, spirit, fine scent, perseverance, and subordination. The foxhound is smaller than the staghound, its average height being from 20 to 22 inches. It is supposed to be a mixed breed between the

staghound or the bloodhound and the greyhound. It is commonly of a white color with patches of black and tan.

Fox Hunting, a favorite English sport much practised during the autumnal and winter months. A *pack* of foxhounds consists of from 20 to 60 couples of hounds according to the frequency of the hunting days. These dogs are carefully bred and trained (see *Foxhound*), and are under the superintendence of one experienced gentleman called the *master*, who has the general control of the whole 'field.' Under him is the *huntsman*, whose duty it is to look after the hounds in their kennels and direct them in the field. He is directly responsible for their condition and training. Next him are the *whippers-in*, whose main duty is that of assisting generally the huntsman both in the kennels and in the field. A less important function of the whipper-in is that of urging on lagging hounds. The night before the hunt, the gamekeeper, calculating on the habits of the fox to leave his burrow or 'earth' in search of food at night, stops all the 'earths' after the foxes have left them. The animals are thus forced to seek refuge in neighboring thickets or other cover, generally near their 'earth,' and this fact determines the arrangements of the day's hunting. The huntsmen assemble in the neighborhood of the stopped 'earth' and draw the neighboring coverts by *throwing off* the dogs to search for the fox. The presence of the fox is generally indicated by the whine of some old and experienced hound who has first scented him; but he may *hang* or keep within the covert for a long time. The person who first sees the fox leave the covert, *break cover* as it is called, gives the *view-halloo* after it has got some little distance, upon which the huntsman collects his hounds and sets off in chase followed by the entire field. The foxhounds follow almost entirely by scent, the fox being itself perhaps far ahead and out of sight. Wherever, therefore, the scent fails the hounds are *at fault*, and there is a *check* till the scent is recovered. When the scent is good most of the hounds *own* it by giving tongue, and they are then said to be in *full cry*. The rider who is first in at *the death* lashes the hounds off and secures the head, feet or *pads*, and tail or *brush* of the fox. The midland counties of England, Leicester, Warwick, Yorkshire, etc., are the most celebrated for fox hunting. Although introduced into the United States, it has never been so ardently pursued here as it has been in England.

Fox Indians, a tribe of N. American Indians belonging to the Algonkian family, now few in numbers and scattered over Oklahoma, Iowa and Kansas.

Fox River, a river of Wisconsin, which enters Green Bay, after passing through Lake Winnebago. It is connected by canal with the Mississippi.

Fox-shark. See *Thresher-shark*.

Foxtail-grass, the common name given to the grasses of the genus *Alopecurus*, because of the close cylindrical panicle in which the spikelets of flowers are arranged, having somewhat the shape of a fox's tail.

Fox Terrier (ter'i-er), the typical dog of the terrier class. While the origin of the fox terrier is of considerable antiquity, and though he has emerged from heterogeneous sources, it is generally conceded that he is the result of a judicious cross between the bull terrier and the black and tan, or between the bull terrier and the beagle. The starting-point of the modern fox terrier dates from about 1860. There are two varieties of this breed: the smooth-haired and the wire-haired. As the latter differs from the former only in the matter of coat, a brief summary of the points of the smooth-coated dog will suffice for both. The head is flat and moderately narrow, decreasing in width to the eyes. The ears are V-shaped and small, dropping forward close to the head, not hanging like a fox hound's. The jaws, upper and under, are strong and muscular, adapted for punishing. The eyes are dark, small, full of life, fire and intelligence. Nose, black. The chest, deep, but not broad. Tail, usually docked, is set rather high and carried gaily. Legs are straight throughout, having no appearance of ankle in front. Coat is straight, flat, smooth, hard, dense and abundant. Color should be white with markings of black or light tan, especially about the head. In character, the fox terrier is gay, lively, alert, intelligent and loyal, and of unfailing pluck. In weight he should not scale over 20 pounds.

Foy (fwà), MAXIMILIAN SEBASTIAN, a French general, born in 1775. He served with distinction under Dumouries, Moreau, and Masséna. In 1815 he commanded a division at Waterloo, where he was wounded for the fifteenth time. He died at Paris in 1825.

Foyle (foil), river of Ireland, flowing N. E. through Tyrone, Donegal, and Londonderry and falling into Lough Foyle near Londonderry. It is navigable

up to Londonderry for vessels of 800 tons.

Foyle, Lough, the estuary of the river Foyle, on the north coast of Ireland, between the counties of Derry and Donegal. It is 16 miles long from northeast to southwest, 1 mile wide at its entrance, and 9 miles broad in the interior. A great part of the bed is exposed at low water.

Fra (frä), an Italian prefix, derived from the word *frate*, brother, and used before the names of monks; for instance, *Fra Giovanni*, Brother John.

Fra Bartolomeo. See *Baccio della Porta.*

Fraction (frak'shun), in arithmetic and algebra, a combination of numbers representing one or more parts of a unit or integer: thus, four-fifths (⅘) is a fraction formed by dividing a unit into five equal parts, and taking one part four times. Fractions are divided into *vulgar* and *decimal.* Vulgar fractions are expressed by two numbers, one above another, with a line between them. The lower, the *denominator*, indicates into how many equal parts the unit is divided; and the number above the line, called the *numerator*, indicates how many of such parts are taken. A *proper fraction* is one whose numerator is less than its denominator. An *improper fraction* is one whose numerator is not less than its denominator. as ⅘, 4/4. A *simple fraction* expresses one or more of the equal parts into which the unit is divided, without reference to any other fraction. A *compound fraction* expresses one or more of the equal parts into which another fraction or a mixed number is divided. Compound fractions have the word *of* interposed between the simple fractions of which they are composed: thus, ½ *of* ⅔ of 1¼ is a compound fraction. A *complex fraction* is that which has a fraction either in its numerator or denominator, or in each of them: thus, $\frac{5\frac{1}{4}}{9}$, $\frac{8}{9\frac{1}{4}}$ and $\frac{5\frac{1}{4}}{6\frac{1}{4}}$ are complex fractions. In *decimal fractions* the denominator is 10, or some number produced by the continued multiplication of 10 as a factor, such as 100, 1000, etc.; hence, there is no necessity for writing the denominator, and the fraction is usually expressed by putting a point (.) before the numerator, as .5 = 5/10; .25 = 25/100; .05 = 5/100. The expression 542.461 would thus be equivalent to 542 461/1000. All calculations are much simplified in decimal fractions; yet, simple as the system is, it was discovered first in the fifteenth century by the German mathematician Regiomontanus.

Fracture (frak'tūr), in mineralogy, is the manner in which a mineral breaks, and by which its texture is displayed; thus, a fracture is *even* when it shows a level face or plane of some extent; *uneven*, when the surface is rough and broken; *conchoidal*, when one side is convex and the other concave, as in a molluscous shell; *fibrous*, when the separated edges have the appearance of torn filaments; *hackly*, when there are many fine sharp points or inequalities.

Fracture, in surgery, is the breaking of a bone. It is simple when the bone only is divided; compound when there is also a wound of the soft parts leading down to the fracture. A fracture is termed *transverse*, *longitudinal*, or *oblique* according to its direction in regard to the axis of the bone. It is called *complicated* if accompanied with dislocation, severe contusions, wounded blood-vessels, or any disease which prevents the union of the bones and causes them to be very easily broken. A *comminuted* fracture is one in which the bone is broken into several small pieces at the point of rupture. An *incomplete* fracture is one in which only a portion of the fibers is broken. A *stellate* fracture is a series of fractures radiating from a center. When a fracture takes place there is a pouring out of fluid—lymph—and cells from the blood contained in the vessels of the lining membrane of the bone as well as from the vessels of the soft parts which have also suffered injury. This material surrounds the broken ends of the bone, becomes firm and consolidated, and in about three weeks is hard enough to keep the broken ends in position. A formation of bone then takes place round the seat of fracture. This is called 'provisional callus,' because, when the process of repair is completed and true bone has formed to unite the break, it is reabsorbed and gradually disappears. Meanwhile a process of repair goes on between the broken ends, uniting them by the formation of true bone or 'definitive callus.' The more quickly and accurately after the break the broken ends are brought together, the more rapid will be the reunion. The treatment of a simple fractured bone is to bring the portions into their natural position and to keep them permanently thus, by splints of some kind, pasteboard splints, for instance, dipped in warm water, with wooden ones exterior to them; or a mass of plaster of Paris may be used for the same purpose.

Fra Diavolo (frä de-ä'vo-lo), a celebrated Neapolitan brigand, whose real name was Michele

Penna. He was born in Calabria in 1760. He quitted the trade of stocking weaving for the army, and served for a time in the Papal Legion. He afterwards became a monk, but was expelled on account of misconduct. He then joined a troop of brigands, of which he became in a short time the leader. The government set a price upon his head; but later, having need of Fra Diavolo's services against the French, they pardoned him and gave him a colonel's commission. At the head of his band he harassed the French, took refuge in Calabria after the conquest of Naples by Bonaparte, and incited the people against the French. He fell at last into their hands in 1806, and was executed as a robber and incendiary. The *Fra Diavolo* of Auber's opera has little or nothing in common with the real Fra Diavolo.

Fraise (frāz), in fortification, a defense consisting of pointed stakes driven into the ramparts in a horizontal or inclined position.

Framingham (frā'ming-ham), a town of Middlesex County, Massachusetts, 23 miles W. of Boston. Manufactures straw goods, shoes, woolens, paper and rubber goods, steam boilers, machinery, etc. A State normal school is located here. Pop. 12,948.

Franc (frangk), a modern French silver coin, but the same name was given to two ancient coins in France, one of gold and the other of silver. The value of the gold franc was about $2.50. The silver franc was in value a third of the gold one. The name was given from the device *Francorum Rex*, 'King of the French,' on the coin when first struck by King John in 1360. The modern French franc is a silver coin and money of account which since 1795 has formed the unit of the French monetary system, and has also been adopted as the unit of currency by Switzerland and Belgium. It is of the value of a little over 19 cents, and is divided into 100 centimes. Coins of the same value, though under different names, have been adopted in several other countries of Europe, as the basis of their system of currency.

Francavilla (frân-kâ-vil'lâ), several places in Southern Italy. The most important is in the province of Lecce, 14 miles W. S. W. of Brindisi. Pop. (1906) 17,759.

France (frans; anciently *Gallia*), a maritime country in the west of Europe, forming one of its most extensive, most populous, and most influential states. It is situated between lat. 42° 20′ and 51° 5′ N.; and lon. 4° 50′ W. and 7° 40′ E., and is bounded N. by the Strait of Dover and the English Channel; W. by the Atlantic (Bay of Biscay); S. by Spain and the Mediterranean Sea; E. and N. E. by Italy, Switzerland, Germany, and Belgium. Its greatest length from north to south is 600 miles, and its greatest breadth 547 miles. The coast-line on the whole is considerably diversified by bays, estuaries, and indentations of various kinds, and presents numerous good harbors and roadsteads. It is studded by a number of islands, especially in the northwest and west, the largest being Oléron, Ré, and Belle Isle. The total area (including Corsica) is 204,092 sq. miles. The capital is Paris; the other large towns in order of population are Marseilles, Lyons, Bordeaux, Lille, Toulouse, St. Etienne, Roubaix, Nantes, and Havre.

Mountains.—The interior is traversed from southwest to northeast by successive chains of mountains, commencing with the Pyrenees and including the Cevennes, the Côte d'Or, the Vosges, and others, forming the watershed, on one side of which the rivers flow west and north into the Atlantic and the English Channel, on the other side east and south into the Mediterranean. At its northeastern extremity this system is met by the Alps and the Jura. A considerable portion of the Western Alps belongs to Southeastern France. Mont Blanc itself (15,781 feet) is mostly within the French boundary-line. Some lofty Pyrenean peaks are also within French territory, the highest being Vignemale (10,792 feet). Near the center of France, and separate from the great watershed of the country, are several groups of volcanic mountains known by the general name of the mountains of Auvergne, the chief peaks of which are the Plomb du Cantal (5983 feet), the Puy de Sancy (6100 feet), and the Puy de Dôme.

Rivers.—The spurs thrown off by the great watershed divide France into seven principal river basins, six of which are on the northwestern slope and one on the southeastern. These are:—1. The basin of the Garonne and its affluents (the Ariège, Tarn, Lot, and Dordogne on the right, and the Gers on the left); with the two secondary basins of the Charente on the north, and the Adour on the south. 2. The basin of the Loire and its tributaries (Nièvre and Maine on the right, the Allier, Loiret, Cher, Indre, Vienne, and Sèvre Nantaise on the left). 3. The basin of the Seine and its tributaries (the Aude, Marne, and Oise on the right, the Yonne and Eure on the left. To the north is the secondary basin of the

Somme. 4. The basin of the Meuse with its affluent, the Sambre. 5. The basin of the Escaut or Scheldt with its affluent the Scarpe. Only the southern portion of these two basins is included within the political boundaries of France. 6. The basin which pours a number of tributaries, the principal of which is the Moselle, into the Rhine. Only a comparatively small portion of this basin also is included within the political boundaries of France. 7. The basin of the Rhône, occupying the whole of the territory which lies to the southeast of the great watershed, the tributaries being the Ain, the Saône, Ardèche, and Gard on the right, and the Isère, Drôme, and Durance on the left. The secondary basins are those of the Var and the Aude. The four great rivers of France are the Loire, Seine, Rhône, and Garonne. France has in all more than 200 navigable streams, with a total navigation of about 5500 miles. Lakes are few, and individually very limited in extent.

Geology.—Among geological formations granite holds a chief place as forming the nucleus of the mountains generally, and being the prevailing rock in the Alps, the Pyrenees, the Cevennes, and in the northwest peninsular portion of the country (Brittany). The other crystalline rocks, consisting chiefly of trachytes and basalts, have received a magnificent development in Auvergne, where whole mountains are composed of them, and where the effects of remote volcanic agency are still visible in extinct craters and lava streams. In the Jura limestone occurs in such enormous masses as to have given its name to a peculiar formation (the Jurassic). The granite is overlaid by gneiss, micaceous and argillaceous slates, succeeded, particularly in the Pyrenees, by mountain limestone. The secondary formation, commencing with this limestone, is largely developed in many parts, and furnishes a considerable number of coal and mineral fields. The tertiary formation covers a vast extent of surface, particularly in the southwest and around Paris.

Climate.—Lying almost wholly within the more moderate portion of the temperate zone, between the isothermal lines of 50° and 60°, France has a climate not inferior to that of any country in Europe. In the south, and particularly the southeast, which is the warmest, the olive is successfully cultivated. Further north to a limit determined by a line drawn diagonally in a E. N. E. direction from the department of Gironde to that of the Vosges, the cultivation of maize or Indian corn extends. More northward still, a line drawn from the mouth of the Loire to Mesières in the Ardennes department marks the extreme limit of the profitable culture of the vine. Beyond this line is the fourth and coldest region. All these regions, notwithstanding their diversities of temperature, are generally healthy, and have an atmosphere remarkable for salubrity, serenity, and brightness.

Agriculture, Etc.—About nine-tenths of the soil of France is productive, and about one-[illegible] of the whole is under the plow. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye, and barley. The crops next in importance to these are meslin or mixed corn, potatoes, hemp, rape, maize, buckwheat, flax, and beet. Beet is cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The cultivation of tobacco is monopolised by the government, and is confined to certain departments. In France the grass is on a much more limited scale than the arable husbandry, and the breeding of cattle is indifferently practised. The rearing of sheep is more successful, much of the wool being scarcely inferior to merino wool. Excellent horses are bred in the north, and as there is an extensive demand for horses for the army, considerable pains are taken in the government studs to improve the breeds. Asses and mules, generally of a superior description, are much employed. The cultivation of the vine is one of the most important branches of French agriculture, the total quantity of land in vineyards being nearly a twenty-fifth of the whole surface. In everything relating to this branch of culture the French are unsurpassed, the various first-class wines which they produce under the names of Champagne, Burgundy, Bordeaux, etc., being universally known. It is estimated that in good years France produces about one-half of the whole wine production of the world. Since about 1870 the vineyards have suffered greatly from the devastations of the *Phylloxera*, an insect introduced from America. Among the most important fruit-trees cultivated in France are the apple, from the fruit of which much cider is made, especially in Normandy; the chestnut, which in some of the central districts of France is a staple of food among the poorer classes; the mulberry tree, cultivated in the southeast both for its fruit and its leaves, the latter furnishing the food of the silkworms so largely reared here; the olive also in the southeast; the pear, plum, peach, orange,

citron, fig, etc. The forests occupy about one-seventh of the whole territory.

Minerals.—Coalfields are numerous, but only two are really of importance—that of Valenciennes in the northeast, forming the western extremity of the great Belgian coalfield, and that of St. Etienne in the southeast, to which the manufactures of that town, Lyons, and the surrounding districts are indebted for much of their prosperity. The annual output falls so far short of the annual consumption that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coalfields contain seams of iron, which are extensively worked, and furnish ore to a great number of blast-furnaces; but of the total amount of ore smelted in the country a considerable proportion is imported. Other metals, such as lead, zinc, manganese, copper, etc., are obtained to some extent. Common salt is obtained from mines of rock-salt, from salt-springs, and in still greater quantity from lagoons and salt-marshes on the coast.

Manufactures.—The most important of the textile manufactures is that of silk goods, having its chief seat at Lyons and the surrounding districts. It employs about two millions of persons, and furnishes about 27 per cent. in value of the whole of the manufactured products of France. After silk goods, though at a considerable distance, follow cotton stuffs and woolens, made largely at Rheims, Amiens, and Beauvais; carpets at Abbeville; tapestry at Paris and Beauvais; linens, including fine muslin, gauze, and lace at St. Quentin, etc.; cutlery, porcelain, stoneware, and common pottery, beet-root sugar, leather, paper, hats, hosiery, steel, iron, brass, and zinc ware, plate and flint glass, etc., besides many ornamental and artistic articles; jewelry, clocks, surgical instruments, types, engravings, etc., which have their common seat in the capital.

Fisheries.—The fisheries of France are important. Amongst the principal is that of sardines on the coast of the Bay of Biscay; that of herring, mackerel, turbot, salmon, etc., in the English Channel and the North Sea; that of tunnies and anchovies on the coasts of the Mediterranean. Oyster-breeding is largely engaged in, the most extensive oyster-beds being those of the basin of Arcachon in the department of the Gironde. Cod-fishing is carried on actively near the Newfoundland banks by French fishermen, and also near Iceland.

Commerce.—The principal towns from which the internal commerce emanates are Paris, Lyons, Rouen, Lille, St. Etienne, Toulouse, Nimes, Nancy, Perpignan, etc. The foreign commerce is chiefly with Great Britain, Belgium, Germany, and Italy. Britain is far ahead of the others, its imports being chiefly silks, woolens, butter, eggs, wine and brandy, and sugar; its exports chiefly wool and woolens, cottons and cotton yarn, coal, machinery, and metals. The shipping of France is much below what might be expected from the development of its foreign commerce, considerably more than one-half of which is carried by foreign vessels. The chief seaports are Marseilles, Havre, Bordeaux, Rouen, Nantes (including St. Nazaire), Dunkirk, Calais, Boulogne, Dieppe.

Canals, Railways, Etc.—The canals are numerous. The Canal du Midi, or, as it is sometimes called, the Canal of Languedoc, starting from a point in the Garonne a little below Toulouse, is continued in an E. S. E. direction into the lagoon of Thau, and thereby gives a continuous navigable communication between the Atlantic and the Mediterranean, in the line of the important towns of Bordeaux, Agen, Toulouse, Carcassonne, and Narbonne. In like manner three separate canals cut across the basin of the Rhône; the Canal du Centre, or of Charollais, connecting the Saône and the Loire; the Rhône and Rhine Canal, so called from uniting these two rivers, partly by the intervention of the Doubs; and the Canal of Bourgogne, connecting the Saône, Yonne, and Seine. In all, France possesses about 3000 miles of canals in addition to about 5500 miles of navigable rivers, giving a total equal to about 1 mile of internal navigation for every 25 square miles of surface. The railways in France, about 30,000 miles long, partly belong to the state, and partly have been granted to private companies for a limited period, at the end of which they will become state property.

Administration of Justice.—In accordance with the general arrangement which divides the whole country into departments, each department into arrondissements, each arrondissement into cantons, and each canton into communes, there is a series of courts commencing with the justice of peace (*juge de paix*) of each commune, who judges in petty causes, but whose more appropriate function is understood to be to act as a kind of umpire between parties at variance, and induce them to settle their differences without proceeding to formal litigation. Failing such arrangement, the complainant brings

his action before the court of first resort (*tribunal de première instance*), there being one such in every arrondissement, besides a *tribunal de commerce* to which mercantile and commercial causes are appropriated. From these courts an appeal lies to the courts of appeal (*cours d'appel*), of which there are twenty-seven, each having jurisdiction over several departments. The most important commercial and manufacturing towns have also commercial courts (*tribunaux de commerce*), the members of which are elected by the chief business men of the respective places. Above all these courts, and properly the only supreme court of the state, is the *cour de cassation*, which has the power of reviewing and annulling the decrees of inferior courts. It sits in the capital.

Education and Religion.—In France the superintendence of education in all its branches is expressly committed to a high functionary, who takes the name of minister of public instruction and fine arts and is assisted by an educational council. The highest educational institutions are either special institutions, such as the Museum of Natural History, the Collège de France, the Polytechnic school; or are a sort of university colleges known as 'faculties' (*Facultés de l'État*), each of which is specially devoted to literature, law, medicine, theology, etc. Several of these are usually grouped together to form one *académie*, there being fifteen academies in all. At these establishments the education given is of the highest description, and need not be particularized. Secondary instruction, either classical or commercial and industrial, is given by the state in the lyceums, by the communes in the communal colleges, or in certain other seminaries. There are about 90 lyceums, generally situated in the capitals of the departments, and over 250 colleges. Primary instruction is given in the communal schools, being compulsory and free. Religion was also, until the year 1906, under the cognizance of the state, and fell within the province of the minister of justice and religion. The state declared that the Roman Catholic was the religion of the majority, but did not establish it; on the contrary, it placed all forms of religion which had more than 100,000 adherents, and were not obviously subversive of social order, on an equal footing, and professed to deal impartially with all by paying salaries to their ministers. But by a law enacted in Dec., 1905, all religions have been disestablished, and church and state separated, while education has been made secular. (See also *Gallican Church.*) Protestants are less than 2 per cent. of the population.

Army and Navy.—By law military service is declared to be obligatory upon every Frenchman who is not pronounced unfit for military service. They have to serve first in the regular army (*armée active*) for three years, then in the reserve of the regular army for six years, next in the territorial army for six years, and finally in the reserve of the territorial army for ten years. This gives France on a peace footing an army of more than half a million, which on a war footing may be brought up to two millions. The French navy is manned partly by conscription and partly by voluntary enrollment. In 1910 the French navy consisted of 25 battleships, 53 cruisers, 14 gunboats, 68 destroyers, 380 torpedo boats, and 56 submarines.

Finance.—France has now one of the largest rates of revenue and expenditure of the nations and a public debt exceeding that of any other country, the total debt amounting to over $5,800,000,000. The chief items of revenue are excise and customs, registration, stamps, posts and telegraphs, and other state monopolies, land tax, licenses, etc.

Constitution.—France has been a republic since the overthrow of the second empire by a Paris mob on the 4th of September, 1870. The details of the constitution were fixed by a law passed by a national assembly which met in 1871 (some revision having been made since). This law places the legislative authority in the hands of an assembly composed of two chambers, the chamber of deputies and the senate. The chamber of deputies is elected by universal suffrage, each department forming one electoral district and a member being elected for every 70,000 inhabitants. The deputies are elected for four years. The senate consists of 300 members, of whom 75 were originally elected for life; but in 1884 it was enacted that vacancies among the life senatorships should be filled up as they arose by the election of ordinary nine-year senators. Both senators and deputies are paid. The head of the government is a president, elected for seven years by a majority of votes of the members of the two chambers sitting as one. The president is assisted by a body of ministers appointed by him. He has the appointment to all civil and military posts.

Weights, Measures, and Money.—The unit of the French monetary system is the franc (of the value of a little over 19 cents), which is divided decimally. (See

Decimal System.) The system of weights and measures is also decimal, the units with their English equivalents being as follows:—the mètre=39.37 inches or 3.28 feet; the kilomètre, or 1000 mètres = 1093.6 yards or .621 of a mile; the are, the square of 10 mètres=1076.441 square feet; the hectare, or 100 ares= 2.47 acres; the square kilomètre=.386 of a square mile; the stère or cubic mètre= 35.317 cubic feet; the litre=1.76 pints; the hectolitre or hundred litres=22.0097 gallons; the gramme=15.4323 grains; the kilogramme or 1000 grammes=2.205 lbs.

Political Divisions and Extent of Empire.—Before the revolution of 1789 France was divided into general governments or provinces, the number of which varied at different epochs. Under Francis I, by whom they were instituted, there were nine, namely, Normandie, Guyenne, Languedoc, Provence, Dauphiné, Bourgogne, Champagne-et-Brie, Picardie, Ile de France. Under Henry III there were twelve, formed by the addition of Bretagne, Orléanais, and Lyonnais. Under Louis XIV the number was fixed at thirty-two, to which a thirty-third was added by the acquisition of Corsica under Louis XV. At the revolution the whole of France, including Corsica, was parcelled out into departments, and each department subdivided successively into arrondissements, cantons, and communes. This division, carried out in 1790, has since maintained its ground. The number of departments was originally eighty-three, but it has been at different times increased and decreased. There are now eighty-seven departments, the last formed being Haut-Rhin (Belfort). The average area of each is about 2300 sq. miles (more than one-third that of Wales). The most recently acquired territories were Nice and Savoie. By the Franco-German war of 1870-71 nearly all Alsace and part of Lorraine was lost. In addition to the territory it occupies in Europe, France possesses (either absolutely or as protected territories) Algeria, Tunis, Senegambia, and other territories in West Africa, a large area in western Sahara and another large area of the Congo region, each of considerably more than 1,000,000 square miles; Reunion, Madagascar and other East African islands; Cochin-China, Tonquin, Anam, and smaller possessions in Asia; French Guiana in S. America, with the islands of Guadeloupe, Martinique, etc.; New Caledonia, Tahiti, etc., in the Pacific. The total French dominions at the beginning of the war of 1914-18 were:

	Area in Sq. Miles.	Population.
France	204,092	38,961,945
Asiatic possessions.	256,000	17,107,000
African do. .	3,520,000	12,948,300
American do. .	41,600	425,270
Oceanic do. .	9,112	85,668
	4,030,814	69,528,183

History.—France or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by a number of independent tribes, who appear to have been mainly Celtic in race. In the latter half of the second century B. C. the Romans conquered a portion of the southeast, and under Julius Cæsar the conquest of all Gaul was completed between 58 and 51 B.C. (See *Gaul.*) Subsequently the country became completely Romanized in language, civilization, and religion, and many flourishing towns sprang up. In the decline of the Roman empire German tribes began to make settlements in Gaul, and it was from a body of these known as *Franks* that the name France arose. Towards the end of the fifth century Clovis, chief of the Salian Franks, made himself master not only of almost all France (or Gaul), but also of a considerable territory east of the Rhine. The dynasty which he founded was called the Merovingian, from his grandfather, Merovæus. Clovis died in 511, leaving his kingdom to be divided amongst his four sons, a plan often followed by subsequent rulers. The Frankish dominions were thus differently divided at different times; but two divisions, a western and an eastern, or Neustria and Austrasia, became the most important. A large part of the history of the Franks under the Merovingian kings is the history of the contests between these two states. Latterly Pippin or Pépin d'Héristal, mayor of the palace of the Austrasian king, conquered Neustria and made his sway supreme throughout the kingdom of the Franks. This date may be regarded as that of the real termination of the Merovingian line, for although kings belonging to this family continued to be crowned till 752, they were mere puppets, 'rois fainéants' as they are generally called; the real power was in the hands of the mayors of the palace. Pépin died in 714. He was succeeded, after a brief period of anarchy, by his son Charles Martel, or Charles the Hammer—a title he earned by the courage and strength he displayed in battle. During his tenure of power all Europe was threatened by the Saracens, who, after occupying Spain, had penetrated into France, and were met by Charles Martel on a plain between Tours and Poitiers, and totally defeated (732),

Charles Martel died in 741, leaving Austrasia and the countries beyond the Rhine to his son Carloman, and Neustria and Burgundy to his son Pépin the Short. On his brother's death Pépin seized his heritage, and in 752, thinking it time to have done with the system of *rois fainéants*, had himself crowned King of the Franks. In 768 he died, and was succeeded by his sons Charles, afterwards known as Charlemagne (Charles the Great), and Carloman. The latter dying in 771, Charlemagne became sole ruler, and conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian mountains on the east, and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III on Christmas Day in the year 800 he was crowned in the name of the Roman people as Emperor of the West. There was as yet, strictly speaking, no kingdom of France, Charlemagne being a German and his empire a German one.

To Charlemagne succeeded in 814 his youngest son Louis *the Pious*. At the death of the latter the empire, after many disputes, was eventually divided by the Treaty of Verdun in 843 amongst his sons, the portion nearly corresponding to modern France falling to Charles the Bald. From this time the separate history of France properly begins, the history of the French language being also traced to the same period, while the eastern portion of the old Frankish territory remained German. After Charles the Bald, the first of the Carlovingian kings, had been succeeded in 877 by Louis II, and Louis II by Louis III (870-882) and Carloman (879-884), Charles the Fat, king of the eastern Frankish territory, became ruler of the western also till 887, when he was deposed. After a brief usurpation by Eudes, Count of Paris, Charles III, the brother of Louis III, was recognised as king. But his kingship was little more than nominal, France being divided into a number of great fiefs, the possessors of which, though acknowledging the feudal supremacy of Charles, were practically independent. In these circumstances Charles, unable to offer any adequate resistance to the Norman pirates who were devastating the coast and making incursions into French territory, surrendered to them, in 912, the province which took from them the name of Normandy. Towards the end of his reign Hugh of Paris, as he is generally called, Duke of France, was really the most powerful person in the kingdom, and throughout the reigns of Louis IV, Lothaire and Louis V, he and his son Hugh Capet held the real power. On the death of Louis V without children in 987 Hugh Capet was chosen as king, and thus became the founder of the Capetian dynasty. The great fiefs of Paris and Orleans, which he controlled, were thus added to the crown, and Paris became the center of the new monarchy.

The first task of the Capetian line was to reconquer the royal prerogatives from the great vassals, but for two centuries without much success. Hugh Capet died in 996, and his first three successors, Robert (died 1031), Henry I (died 1060), and Philip I (died 1106), effected nothing whatever towards the establishment of the royal authority. Louis VI was more successful, being greatly helped by the fact that the nobility had been much weakened by the Crusades. The growth of the towns also, which ultimately became the allies of the kings, was a powerful check on the nobles.

Louis VI died in 1137, and was succeeded by his son Louis VII, who reigned till 1180. During his reign the stability of the French throne was endangered by the influence acquired in France by Henry II of England, who came into possession by inheritance and by his marriage with Eleanor of Aquitaine of the whole of the west of France except Brittany. Louis was succeeded by his son Philip Augustus (Philip II), who did much to strengthen the throne, and deprived John, the king of England, of Normandy, Maine, and Anjou. His son Louis VIII, who succeeded in 1223, carried on the work by the conquest of Poitou, and a religious war being proclaimed against the Counts of Toulouse, who protected the Albigenses, that house was extinguished, and their domains passed to the royal family. Louis VIII died in 1226, and under the wise rule of Louis IX (St. Louis) the influence of the crown went on increasing, as it did also under Philip (III) the Bold (died 1285), Philip (IV) the Fair (died 1314), Louis X (died 1316), John I (died 1316, after a reign of five days), Philip V (died 1322), and Charles IV (died 1328), by the acquisition of fresh domains and other means until the outbreak of the wars with England.

The first branch of the Capetian line of kings became extinct on the death of Charles IV, the last of the sons of Philip the Fair, the Salic law excluding the female succession. The crown thus fell to Philip of Valois, a cousin, who became king as Philip VI. His claim was disputed by Edward III of England, and the dispute led to a series of wars which

were not terminated for more than 120 years. During this period France was reduced to a state of great misery. While Edward, victorious over Philip VI, and after his death over John (II) the Good, who was taken prisoner at Poitiers in 1356, compelled the surrender to England of some of the finest provinces of France by the Treaty of Brétigny in 1360, the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V) the Wise, who succeeded John the Good in 1364, and his constable, Du Guesclin, were able to restore order only for a short time, although during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI (1380-1422), during which Henry V of England, reviving the claim of Edward III to the French crown, invaded France, won the field of Agincourt, and obtained a treaty (Treaty of Troyes) acknowledging the right of succession to the French crown in himself and his descendants. Charles VI died in 1422, a few weeks after Henry V, whose son, Henry VI, a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431 the remarkable peasant girl, JOAN OF ARC, animated the French in the cause of the dauphin, who was crowned as Charles VII at Rheims in 1429, and in 1451 the English had lost all their possessions in France, except Calais. The political shrewdness and perfidy of Louis XI (1461-83) completed the subjugation of the great barons, and laid the foundation of absolute monarchy. Maine, Anjou, and Provence were left to him by the will of the last count, and a large part of the possessions of the Duke of Burgundy, including Picardy, Artois, the duchy of Burgundy proper, and Franche Comté, all came into his hands not long after the death of Charles the Bold, in 1477. His son and successor, Charles VIII (1483-98), united also Brittany to the crown by his marriage with Anne, the heiress of the fief, and effected a conquest of Naples, which lasted but a short time.

Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orleans (1498), in the person of Louis XII, who was descended from Louis of Valois, Duke of Orleans, brother of Charles VI. In order to keep Brittany attached to the crown he married the widow of his predecessor. On his death the crown reverted to another branch of the house of Valois, that of Angoulême, Francis I (1515-47) being the grandson of John, Count of Angoulême, uncle of Louis XII. Francis I, still continuing the attempts at conquest in Italy, was brought into conflict with Charles V of Germany, who also claimed Milan as an imperial fief. The result was five wars between France and Germany, in the first of which Francis had to retreat across the Alps; in the second he was taken prisoner at Pavia; in the third he seized Savoy and Piedmont, which the Peace of Crespy (1544), made at the conclusion of the fourth war, allowed him to keep.

Francis I died in 1547, and his son, Henry II (1547-59), pursuing the same policy, renewed the war for the fifth time with the house of Hapsburg. In the Peace of Cateau-Cambrésis (1559), with which it ended, Henry had to surrender Savoy and Piedmont, but remained in possession of the German bishoprics of Metz, Toul, and Verdun. The year before, Calais, the last English possession in France, had been captured by Francis, Duke of Guise. Francis II, the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559-60). The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the administration of Charles IX (conducted during his minority by the queen-mother, Catharine de' Medici) France was inundated with the blood of Frenchmen, shed in the religious wars from 1562. (See *Bartholomew's Day.*) These continued throughout the reign of Charles IX and his successor, Henry III (1574-89), and were only terminated when Henry IV originally King of Navarre, and since the death of Henry III King of France, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

Henry IV was the first French sovereign of the house of Bourbon, which inherited its right to the throne from a son of Louis IX. He united to the crown of France the Kingdom of Navarre, which he had inherited from his mother, Jeanne d'Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman, establishing religious toleration (Edict of Nantes, 1598), and laboring diligently for the welfare of the state. He was cut off prematurely by the dagger of the fanatic Ravaillac (1610). During the minority of Henry's son,

Louis XIII, the French policy was at first wavering, until the prime-minister, Cardinal Richelieu, gave it a steady direction. He restored the French influence in Italy and the Netherlands, humbled Austria and Spain, and created that domestic control which rendered the government completely absolute.

Louis XIII died in 1643, the year after his great minister, and was succeeded by Louis XIV, 'le Grand Monarque.' The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis was declared of age. During his ministry France obtained by the Peace of Westphalia (1648) the German province of Alsace and by the Peace of the Pyrenees (1659) parts of Flanders, Hainault, Luxembourg, etc. After the death of Mazarin, in 1661, Louis XIV took the government into his own hands, and ruled with an absolute sway. The period which immediately followed was the most brilliant in French history. His ministers, especially Colbert, and his generals, Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; the writers of the period were also among the greatest in French literature. An unsuccessful attempt was made on the Spanish Netherlands; a war was undertaken against Holland, Spain, and Germany, which ended in France receiving Franche Comté and other places from Spain and Freiburg from Germany. In 1681 Strasbourg was seized from the empire in a time of peace. The last war of Louis was the war of the Spanish Succession (1701-14), which resulted unfortunately for France. During this reign great injury was done to French industry by the revocation of the Edict of Nantes in 1685. Louis XIV died in 1715, leaving the finances in disorder, and a national debt amounting to no less than 4,500,000,000 livres. Louis XV, the grandson of Louis XIV, succeeded at the age of five years. During his minority the regent, the Duke of Orleans, squandered the revenues in the most reckless manner, and matters went from bad to worse. In 1723 Louis was declared of age, but he sank under the pernicious influences of mistresses, like Pompadour and Du Barry, into extravagance and license, entering into useless and costly wars (war of Austrian Succession, 1740-48; Seven Years' war, 1756-63), and contracting enormous debts. During his reign two important acquisitions were made by France, namely, Lorraine and Corsica.

With the [illegible] of Louis XVI began the period of [illegible]xpiation for the misdeeds of the French monarchy and aristocracy, which had culminated in the preceding reign. The king himself was amiable, but the whole administration was rotten, and the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The good intentions of Louis were neutralized by a total lack of energy and firmness. The first difficulty of his government, and the rock on which it split, was the hopeless condition of the public finances, with which Turgot, Necker, Calonne, Brienne, and again Necker tried in vain successively to grapple. Finding all ordinary measures unavailing, Necker demanded the convocation of the States General, which had not met since 1614. They met on 5th May, 1789, but as the nobles and clergy refused to conduct business so as to give the Third Estate its due weight, the deputies of this body assumed the title of the National Constituent Assembly, and resolved not to separate till they had given a constitution to France. The clergy and nobles then yielded, and the fusion of the three orders was effected on 27th June. Foreign troops, however, were brought to Paris to overawe the assembly. The people now demanded arms, which the municipality of Paris supplied; and on 14th July the Bastille was captured and destroyed. Lafayette was made commander of the newly-established national guard. On the 4th August a decisive step was taken by the abolition of all feudal rights and privileges. On 5th October Versailles was attacked by the mob, and the royal family, virtually prisoners, were taken to Paris by Lafayette. The king tried to obtain the aid of some of the foreign powers against his subjects, and made his escape from Paris (20th June, 1791); but he was recognized, arrested at Varennes, and brought back to Paris. On 30th September, 1791, the assembly brought its work to a finish by producing a new constitution, which was sworn to by the king on 14th September, and he was then reinstated in his functions. This constitution deprived the king of arbitrary powers, provided liberty of worship and freedom of the press, of commerce, of industry; abolished the laws of primogeniture and entail as well as titles; all France was redivided into eighty-three departments, nearly equal in extent.

The Constituent Assembly was, according to the constitution, immediately followed by the Legislative Assembly, which met October 1, 1791, and in which

there were two parties of political importance, the Girondists, moderate republicans, so named because their leaders came from the department of the Gironde, who led it, and the Montagnards, extreme radicals, known collectively as the Mountain, because their seats were the highest on the left side of the hall, who subsequently became all-powerful in the convention. The constitutionalists and monarchists were already powerless. The declaration of Pilnitz by the Emperor of Germany and the King of Prussia, threatening an armed intervention on behalf of the king, compelled the assembly to take a decisive course, and on 20th April, 1792, war was declared against Austria and Prussia. Reverses to the French troops caused a popular rising, and the Tuileries, after a sanguinary combat, were taken and sacked. The king took refuge with his family in the Assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a National Convention in place of the Assembly. The first act of the Convention was to proclaim a republic. On 3d December the king was cited to appear before it. On 20th January, 1793, he was sentenced to death within twenty-four hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, and Spain joined the coalition. The extremists in France only grew more violent, a committee of public safety, with sovereign authority, was appointed 6th April, and the Reign of Terror begun. The struggle between the Girondists and the Montagnards or Jacobins terminated in favor of the latter. A new constitution was adopted by the Convention on 23d June, called the Constitution of the Year 1, the Republican Calendar being adopted on 5th October, 1793, the year 1 beginning on September 22, 1792. Christianity was formally abolished. Risings against the government were put down with frightful bloodshed. Both in Paris and the provinces executions and massacres of persons alleged to be disaffected to the party in power followed each other daily. The queen was executed on 16th October, 1793, the Girondists on 31st October, and others followed, Robespierre being foremost in the bloody work. At length the reign of terror came to an end by the execution of Robespierre and his associates on 27th and 28th July, 1794. Danton and Hébert, his old allies, he had already brought to the scaffold. Marat, another man of blood, had perished by assassination. The campaigns of 1793 and 1794 resulted favorably to the French arms, which were carried beyond the French frontier, Belgium and Holland being occupied, Spain being invaded, and the allies being driven across the Rhine. These successes induced Prussia and Spain to sign the treaties of Basel (1795), recognizing the French republic. In 1795 the Convention gave the republic a new constitution, a chamber of *Five Hundred* to propose the laws, a chamber of *Ancients* to approve them, an executive of five members, one elected annually, called the *Directory*. The Convention was dissolved on 26th October.

Napoleon Bonaparte now began to be the most prominent figure in French affairs; and after his brilliant successes against the Austrians both north and south of the Alps, and his empty conquest of Egypt, it was not difficult for him to overthrow the government of the Directory. This was accomplished in the revolution of 18th and 19th Brumaire (9th and 10th November, 1799), the Directory being succeeded by the Consulate, Bonaparte himself being appointed *First Consul* for ten years. The other two consuls, Cambacérès and Lebrun, were to have consultative voices only. The new constitution (constitution of the year VIII. originally devised by Sièyes) was proclaimed the 15th December. Under the appearance of a republic it really established a military monarchy. The history of France for the next sixteen years is virtually the history of Napoleon. (*See Napoleon I.*) In 1802 the constitution was amended, Napoleon being made consul for life, with the right of appointing his successor. In 1804 he was proclaimed emperor, this being confirmed by a popular vote of 3,572,329 against 2569. The emperor was consecrated at Paris by Pius VII, and in 1805 he was also crowned King of Italy. For years the continental powers, whether singly or in coalitions, were unable to stand against him, though at sea France was powerless after the great victory by Nelson over the French and Spanish fleets at Trafalgar (1805). The Austrians and Russians were decisively defeated at the great battle of Austerlitz (1805); the King of Naples was dethroned and Napoleon's brother Joseph was put in his place; another brother, Louis, was made King of Holland; while for a third, Jerome, the Kingdom of Westphalia was erected (1807). Prussia was conquered and compelled to accede to humiliating terms. Napoleon was at the height of his power in 1810 and 1811, his empire then extending from

Denmark to Naples, with capitals at Paris, Rome, and Amsterdam. By this time, however, the Peninsular War (see that art.) had broken out, which was one immediate cause of his downfall, the disastrous Russian campaign of 1812 being another. The latter cost the French the loss of at least 300,000 men. A new coalition was now formed against Napoleon, and in 1813 he was disastrously defeated by the allies at the great battle of Leipzig. By this time the Peninsular War was drawing to a close and Southern France was actually invaded by Wellington. The allies entered Paris on 31st March, 1814. Napoleon abdicated and received the island of Elba as a sovereign principality. Louis XVIII was proclaimed King of France, and concluded the Peace of Paris (May 30, 1814). A congress of the great powers had assembled at Vienna to adjust European affairs, when it was announced that Napoleon had left Elba, returned to Paris, 20th March, 1815, and been reinstated without resistance in his former authority. The allied sovereigns proclaimed him an outlaw and renewed their alliance against him. Napoleon, anticipating the attack, crossed the Sambre with 130,000 men, defeated Blücher in the battle of Ligny, and marched against the British, who had taken position at Waterloo. Here, on the 18th, was fought the decisive battle which resulted in his final overthrow. On the 7th July the allies entered Paris for the second time. Napoleon surrendered to the British and was sent to St. Helena as a prisoner.

Louis XVIII at first governed with the support of a moderate Liberal party, but the reactionary spirit of the aristocrats and returned émigrés soon got the upper hand; the country, however, was prosperous. Louis died 16th September, 1824, and his brother, Charles X, succeeded. On 26th July, 1830, the Polignac ministry, strongly reactionary in its tendencies, published ordinances suppressing the liberty of the press and creating a new system of elections. The result was an insurrection during the three days, 27th-29th July, by which Charles X was overthrown and Louis Philippe of Orleans proclaimed king, 9th August, 1830. During the last days of Charles X's reign a French expedition had captured the city of Algiers and laid the foundation of the French colony there. During the eighteen years of Louis Philippe's reign the chief events were the taking of the Citadel of Antwerp, the temporary occupation of Ancona, both in 1832, and in 1835 the completion of the conquest of Algeria. But later, under the ministry of Guizot, a policy of resistance to all constitutional changes was adopted, and a strong opposition having been formed, on 24th February, 1848, another revolution drove Louis Philippe into exile. A republic was proclaimed, and on the 10th December, 1848, Louis Napoleon, nephew of the great Napoleon, was elected president for four years. The president, having gained the favor of the army, dissolved the legislative assembly on 2d December, 1851, put down all resistance in blood, and by this *coup d'état* established himself as president for the further term of ten years. A plébiscite of 7,839,216 votes confirmed the appointment. On 2d December the president was declared emperor under the title of Napoleon III (a son of the great Napoleon being counted as Napoleon II); and a plébiscite of 7,824,129 votes was again got to confirm the appointment. The Crimean War (1854-55) and the war against Austria on behalf of Italy (1859) distinguished the early part of his reign. The latter greatly aided in the foundation of a United Italy, and gave France the territories of Savoie and Nice (1860). In 1870 the uneasiness of Napoleon and the French at the steady aggrandizement of Prussia broke out into flame at the offer of the Spanish crown to a prince of the house of Hohenzollern. Napoleon, not satisfied with the renunciation of the German prince, demanded a guarantee from the King of Prussia that the candidature should never be resumed. This being refused, he declared war. (See *Franco-German War.*) One French army was driven back by the Germans and cooped up in Metz, another was pushed northwards to Sedan, and so hemmed in that it had to surrender with the emperor at its head. On the news of this disaster reaching Paris the republic was proclaimed. After an almost uninterrupted series of victories the Germans became masters of the French capital (28th January, 1871), and the war ended in France giving up to Germany Alsace and a part of Lorraine, and paying a war indemnity of five milliards of francs ($1,000,000,000). Meanwhile civil war had broken out in Paris, which was suppressed with great difficulty. (See *Commune of Paris.*) The assembly elected in 1871 for the ratification of peace with Germany found it expedient to continue their functions, Thiers being the head of the administration. In 1873 the Thiers administration was overthrown and replaced by one under Marshal MacMahon. In 1875 a republican constitution was drawn up. In 1879 MacMahon resigned his presidentship, be-

ing succeeded by Jules Grevy, who in turn was followed by Sadi-Carnot in 1887. Carnot was assassinated in 1894, and was succeeded by Casimir-Perier as president, who resigned January 15, 1895. Two days later Félix Faure succeeded him. During his term of office France was violently agitated by the Dreyfus case, and had a dispute with England about Fashoda, Soudan. Faure died suddenly, February 15, 1899; succeeded by Emile Loubet. Armand Fallières was elected president January 17, 1906. The hostile feeling between Germany and France due to French extension in the Soudan was brought to a head in 1911 as a result of an outbreak of rebel tribesmen. An active dispute arose, which was finally settled by France's giving Germany a large tract of land in the region of French Congo. Raymond Poincaré succeeded M. Fallières as president, Jan. 17, 1913. In 1914 France entered the European War against Germany and Austria, supported by her allies, Russia and Britain.

Of these nations the situation of France was the most critical. Hostile sentiment had existed between that country and Germany since the war of 1870-71, the loss of Alsace-Lorraine being the most bitter pill which for centuries France had been forced to take. As regards the military conditions of these two countries, the difference was by no means so great as it had been in the previous war. The statesmen of France had taken care that the army of that country should not again be found in the unfit state in which it proved to be when Napoleon III, in 1879, flung down the gage of battle against Prussia and its German allies. But, in 1914, no other country in the world had become so complete a fighting machine or had such a splendid equipment of military material as the Prussia of that date, and the kaiser of the new German empire was not without warrant for the confidence with which he defied the combined powers of France, Great Britain and Russia. It was his first aim to invade and overcome France before any efficient aid could reach it from its allies, and, avoiding the French line of defense, he poured his battalions into Belgium and across the French-Belgian frontier with all possible haste. Yet small and weak as Belgium was, it courageously held back the German armies long enough to give France an opportunity to get its forces into the field and for a small contingent of British troops to come to its aid.

Mobilization began in France at midnight of August 2, 1914, and by the time the German army had reached the French frontier there was a large army ready to meet it. That the kaiser and his military advisers expected to take the French by surprise and paralyze their armed forces as had been done in 1870 is highly probable, but they found them well equipped and ably commanded, and though they were forced to retreat before the irresistible advance of the German forces, this was done slowly and stubbornly. The small British contingent at Mons was struck in late September, and saved itself only by a hasty retreat, and the much stronger French army was soon being driven back. This continued until the foe was only a few miles distant from Paris. But the French commander, Marshal Joffre, was simply making a strategic retreat, and on September 6 checked his army, brought up the considerable force that held the forts around Paris and made so vigorous an assault upon the enemy that the tables were turned and the Germans, in turn, forced to retreat. For the details of this signal victory, one of the most notable in the whole war, see *Marne, Battle of the*. It put an end to the advance of the Germans, forced them to retreat day after day, until the line of the Meuse was reached, and put a final end to the forward movements of the German armies in the western section of the vast field of warfare.

The French forces had, meanwhile, entered Alsace and made some progress in that section. But the tide of war soon swept further to the west and efforts to regain this coveted territory ceased. For important military events we must now go forward to the spring of 1915, when the augmented British forces fought gallantly, though not victoriously, at Ypres and Neuve Chapelle, and the French in the Artois region, the latter a tremendous though not successful effort to break the strongly held German lines. But the most striking and long contested of the efforts in this section of the far-extended field of battle was the desperate effort of the army under the Crown Prince of Germany to capture the stronghold of Verdun and open in this direction a new route of advance on Paris. This great struggle continued for months, the German army losing heavily in its charges on the outlying defenses of the stronghold. Some of these were taken, yet the French held firmly to their fortress, and in the end, after a struggle of well nigh a year's duration, regained all the lost ground. It was a terribly costly enterprise, in men and munitions, on the part of Germany, and the last strong effort made by them to

capture the famous fortress defended by gallant men whose slogan was 'They shall not pass.' In 1918 the German armies swept over French territory in what was intended to be a series of irresistible drives, but the American armies were now on the scene and the German tide was turned at Château-Thierry (q. v.) at the second battle of the Marne. Afterward the German tide was ever backward, until a plea for an armistice resulted in the cessation of hostilities on November 11, 1918. The successful conclusion of the war was due in great part to the famous French soldier, Marshal Foch. The French casualties were estimated at 4,000,000, and the money cost to France was $32,000,000,000. By the peace of Versailles (see *Treaty*), the territories of Alsace and Lorraine, held by Germany since 1871, were restored to French sovereignty as from the date of the armistice, Nov. 11, 1918. As compensation for the destruction of the coal mines in the north of France, Germany ceded to France the coal mines situated in the Saar Basin.

France, Language of. At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were Celtic. After the conquest of Gaul by the Romans all these dialects were gradually supplanted by Latin, except in Brittany, where a Celtic dialect still holds its ground. The popular Latin of Gaul, of course, exhibited considerable differences from the written and classical Latin, and by the seventh or eighth century the literary and the popular languages had come to be quite clearly distinguished as the *Latina* and the *Romana*, respectively. Besides the Celtic words, not very numerous, which were included in the new speech, it was considerably modified by Celtic habits of speech, new sounds being introduced. It was still further modified by the influences introduced with the Teutonic invasions. After the Franks in Gaul had abandoned their native language and adopted this new Romanic or Romance tongue it became known as the *Francisca*, later *Française*. The oldest known monument of the new dialect is the oath of Louis the German, taken at Strasburg, in 842. In the ninth and tenth centuries two main branches or groups of dialects came to be recognized, the *Langue d'Oc*, spoken in the districts south of the Loire, and the *Langue d'Oil*, spoken in the provinces of the north and the east. In the thirteenth century the Langue d'Oil, spoken in the central province of Ile de France, where the capital, Paris, was, came to be regarded as the classical language of the country, all other dialects sinking into the condition of *patois*. At the beginning of the sixteenth century Francis I prohibited the use of Latin at court and in the public tribunals and formally recognised the French as the national language. As one of the Romance languages it is a sister tongue of Italian, Spanish, and Portuguese.

France, Literature of. French literature proper begins in the eleventh century with the epic or narrative poems known as *chansons de geste*, and produced by the class of poets known as *Trouvères*. These poems belong to Northern France and are very numerous. They are usually divided into three heads: poems relating to French history, in particular to the deeds of Charlemagne, his descendants and vassals; poems relating to Alexander the Great and to ancient history; and poems of the Arthurian cycle, or relating to King Arthur. They are generally written in verses of ten or twelve syllables, and are of a length varying from 1000 to 20,000 lines. One of the oldest and best examples of the first class is the *Chanson de Roland*, or *Song of Roland*. Of the Arthurian cycle, the *Roman de Rou* and *Roman de Brut;* and of the Alexandrine cycle, the *Alexandre* by Lambert li Cors, and *La Guerre de Troie* ('War of Troy'), by Benoît de St. More, are examples. Out of the *chansons de geste* grew the *romans d'aventures*, poems of fiction which are not connected with any of the well-defined topics of the *chansons de geste*. Distinct from these are the *fabliaux*, metrical tales of a witty and sarcastic kind, belonging mostly to the twelfth and thirteenth centuries. Allied to these is the *Roman de Renard*, or *History of Reynard the Fox*, a poem, or rather series of poems, written between the end of the twelfth and the middle of the fourteenth century, and forming a satirical picture of all the classes and institutions of the time.

Side by side with these epics, romances, and tales an abundant lyric poetry flourished from the eleventh century. This song literature is mainly of a sentimental character, and is usually divided into two classes, *romances* and *pastourelles*. It is in general remarkable for its lyric grace and skillful melody. Its writers, known in literature as Troubadours, were very prolific. The first known of these was Guillem IX, count of Poitiers, near the end of the eleventh century, their most brilliant period being during the second half of the twelfth and the first half of the thirteenth centuries. The list of Troubadours numbers about 400 in all,

love being the leading topic of their poems, Peire Vidal and Bertrand de Born are among the best known of them, while Guiraut Riquier, near the close of the thirteenth century, is spoken of as 'the last of the Troubadours.' Their language was the melodious Provençal of the South. Amongst the principal of the early lyrists are Thibaut de Champagne (1201-53), Charles of Orleans (1391-1465). The latter, a graceful writer of ballades and rondels, was amongst the last of the real Trouvères. Rutebeuf (born 1230), also a writer of fabliaux, is the first of a series of poets, culminating in François Villon, who passed their life in a bohemian alternation of gaiety and misery, celebrating each phase with equal vigor in verse. The *Roman de la Rose*, the work, in its earlier part, of Guillaume de Loris, who lived in the first half of the thirteenth century, in the later, of Jean de Meung (died 1320), is one of the most notable productions of the time. It consists of more than 22,000 verses, and is a curious combination of a love poem and a satire. Olivier Basselin (who died about 1418) wrote songs celebrating the praises of wine. François Villon (1431-1500), the greatest of French poets before the Renaissance, wrote two compositions known as the *Great* and the *Little Testament*, interspersed with lyrical compositions of great poetic merit.

In prose literature the first important work is the *Histoire de la Conquête de Constantinople*, by Villehardouin (1167-1213). The *Mémoires* of the Sieur de Joinville (1223-1317) delineates the life of St. Louis and the exploits of the last Crusade. Froissart (1337-1410), the 'Herodotus of his age,' gives a vivid picture of the chivalry of the 14th century. With Philippe de Commines (1445-1509) we are introduced to Louis XI, and his contemporaries in a style of history which, if less naïve and charming, shows a deeper and more philosophical sense of things. In the lighter prose the *Cent Nouvelles Nouvelles* already shows the capacity of the French language for the short, witty tale.

The revival of classical learning and the reformation of religion exercised a powerful influence on the French literature of the sixteenth century. Rabelais (1483-1553), a profound but often gross humorist, and Montaigne (1533-92), an interesting and instructive, though somewhat skeptical essayist, hold the first rank. Calvin (1509-64) did much by his great theological work, *Institution de la religion Chrétienne*, to mold French prose in the direction of strength and gravity. Amongst the other works which indicate the rapid development of French prose in this century are Brantôme's *Mémoires*, the *Heptaméron* of Queen Margaret of Navarre (1492-1549), the translations by Amyot (1513-93) of Plutarch and other classical writers, and the celebrated political pamphlet, *Satire Ménippée*. In poetry Clement Marot (1497-1544) gave a new elegance to the language in his epistles and epigrams. Pierre de Ronsard (1524-85) and the other members of the celebrated *Pléiade*, Iodelle, Belleau, Dubellay and others, sought to enrich their native tongue by the introduction of classical words, constructions, and forms of verse. Du Bartas (1544-90) and D'Aubigné (1550-1630) carried on the work of Ronsard. Mathurin Régnier (1573-1613) may be said to close this school of poetry. He unites in himself the lighter qualities of the style of Villon and Marot with the erudition and command of language characteristic of the Ronsardists. Malherbe (1556-1628), the creator of a new taste in literature, opposed with success the tendency of the Ronsard school, and falling into the opposite excess sacrificed everything to correctness. It was his school that set the example of the smooth but monotonous Alexandrine. With the Renaissance translations of the classical dramas appeared, and a member of the *Pléiade*, Jodelle (1532-1573), wrote the first regular tragedy (*Cléopatre*) and comedy (*Eugène*).

The seventeenth century opened with Alexandre Hardy (1560-1631), Rotrou (1609-50), Tristan (1601-55), Mairet (1604-88), Du Ryer (1605-48), and a host of other dramatists, for nearly a hundred can be enumerated in the first quarter of the century. At length Pierre Corneille (1606-84), with his *Cid*, *Cinna*, *Horace*, and *Polyeucte*, brought French tragedy to a degree of grandeur which it has not surpassed. Of seventeenth century prose writers Pascal (1628-62) is vigorous and satirical in his *Lettres provinciales;* profound, if sometimes mystical, in his *Pensées*. The letters of Balzac (1584-1684) and Voiture (1598-1648), though rhetorical, were valuable as models for elegant prose. Descartes (1596-1650) showed in his *Discours sur la Méthode* that the language was now equal to the highest philosophical subjects, and the great work of his disciple, Malebranche, *Recherche de la Vérité* is equally admirable for its elegance of style and its subtlety of thought.

The age of Louis XIV is known as the golden age of French literature. Besides Corneille, Racine (1639-99) represents

the tragic drama, and Molière (1639-03) brought his great masterpieces of comedy on the stage. The 'inimitable' La Fontaine (1621-95) wrote his *Contes* and the most charming collection of fables. For his critical influence, if not for his poetry, Boileau (1636-1711) holds a prominent place. In eloquence the sermons and funeral orations of Bossuet, Bourdaloue, and Massillon take the first rank. Bossuet is also celebrated as a controversialist and theological historian. Very important, too, are the memoir and maxim writers of this time. Amongst the former are the Cardinal de Retz, Madame de Motteville, Madame de Sévigné (1627-96), and others; amongst the latter are La Rochefoucauld (1613-80), St. Evremond (1613-1703), La Bruyère (1639-99). In fiction Le Sage, who also wrote comedies, produced his immortal *Gil Blas* and the *Diable Boiteux;* and the versatile Fontenelle wrote his *Dialogues des Morts.*

Amongst the writers of the eighteenth century Voltaire holds the first place. He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher, and he remained at the head of the republic of letters for more than half a century. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712-78), a writer of an eloquent sentimental vein, well represented by his *Nouvelle Héloïse* and his famous *Confessions.* His new theories of politics and education are embodied in his *Contrat Social* and *Emile.* Buffon (1707-88) devoted himself to the production of his immense natural history. Montesquieu (1689-1755), commencing with the *Lettres Persanes,* a satire on French manners and government, followed with a historical masterpiece, *Considérations sur la Grandeur et la Décadence des Romains,* and finally with his great work, the *Esprit des Lois.* Diderot (1713-83), a powerful and suggestive writer in many departments, and D'Alembert (1717-83), a great geometrician, founded the *Encyclopédie,* a vast review of human knowledge, often hostile to social order and always to religion. Amongst the philosophers Helvetius, D'Holbach, and La Mettrie represent the extreme materialistic and anti-Christian school. Condillac and Condorcet kept most on the side of moderation. Among the writers of fiction Bernardin de St. Pierre (1737-1814), author of *Paul et Virginie,* and Prévost (1697-1763), author of *Manon Lescaut,* are particularly worthy of mention; while dramatic literature was enriched by the *Barbier de Séville* and the *Mariage de Figaro* of Beaumarchais (1732-99). The age was not poetical; poetry had degenerated into imitations of foreign descriptive poets, such as Thomson. The most successful writer of this stamp was Delille (1738-1813). André Chénier (1762-94), the most promising of all, fell beneath the guillotine just after completing his *Jeune Captive.*

Neither the revolution nor the first empire was favorable to literature. Chateaubriand (1768-1848) and Madame de Staël (1766-1817) gave a new turn to the taste and sentiment of the time, the former in his *Génie du Christianisme* and his *Martyres,* clothing the history of Christianity in the romantic hues of his imagination, the latter in her *Corinne* and *De l'Allemagne* introducing the idealistic spirit and thought of the Germans to her countrymen. A purely reactionary school of thought was headed by Joseph de Maistre (1754-1821), the advocate of theocracy, with a vigorous despotism for its system of government.

Later on in the nineteenth century the influence of Goethe, Schiller, Shakespere, Scott, and Byron began to be felt, and a new school, called the *romantic,* as opposed to the old or *classic,* sprung up, headed by Victor Hugo (1802-85), who promulgated the new theories in the preface to his drama of *Cromwell,* and carried them into practice in numerous poems. The most notable of his associates were Alfred de Vigny (1779-1863), author of a volume of *Poëmes,* and of a novel, *Cinq Mars;* Sainte-Beuve (1804-69), who published several volumes of poetry in those early days, but became famous later on as a critic, perhaps the best France has ever possessed; Alfred de Musset (1810-57), who produced some of the finest lyrics in the language. Charles Nodier, Gérard de Nerval, the two Deschamps, and, later, Théophile Gautier, with others, also belonged to the band of romanticists. On the stage the dramas of Alexandre Dumas, the elder (1803-74), though melodramatic and of inferior literary value, served as rallying points for the new school. To English readers, however, he is best known by his novels. A reactionary movement was attempted, led by Ponsard (1814-67) and Emile Augier (1820-89). Casimir Delavigne (1793-1843) attempted to combine the classic and romantic schools; and Lamartine (1790-1869) is more than half a romanticist by sentiment and style. Béranger (1780-1857), the greatest of French song-writers, may be considered as belonging to neither of the two schools, nor can the sparkling comedies and vaude-

villes of Eugène Scribe be claimed by any of the rival parties.

Among novelists Balzac (1799-1850), by his astonishing series of works, *La Comédie Humaine*, has established his claim to first place. The novels of George Sand (1804-76), showed delightful style and an optimistic outlook upon life. Eugène Sue (1804-57), gained popularity through his *Mysteries of Paris* and *Wandering Jew;* while Henry Beyle ('Stendhal') launched the first psychological novels. Prosper Merimée (1803-79) is chiefly known by his *Colomba*, a tale of the Corsican vendetta. Gustave Flaubert (1821-80) combined romanticism and realism and may be called the father of the modern realistic or 'naturalist' school, of whom Emile Zola (1840-1903), Alphonse Daudet (1840-97), and Edmond (1822-97), and Jules (1830-70), de Goncourt are the chief exponents. Guy de Maupassant (1850-92) is the greatest master of the short story. Of later writers Anatole France (born 1844), stands first, though Julien Viand ('Pierre Loti'), Edouard Rod (1857-1909), Ferdinand Fabre (1830-98), and René Bazin (born (1853) deserve mention.

In works of history the nineteenth century was very prolific, the leading historians being Michaud (1767-1839), Sismondi (1773-1842), Guizot (1787-1874), Amédée Thierry (1787-1873), Augustine Thierry (1795-1856), Mignet (1796-1884), Thiers (1797-1877), Michelet (1798-1874), Henri Martin (1810-83), Victor Duruy (1811-1894), Louis Blanc (1813-82). Literary historians are: Villemain (1790-1870), Vinet (1797-1847), J. J. Ampère (1800-64), Littré (1801-81), St. Marc-Girardin (1801-73), Sainte-Beuve (1804-69), Taine (1828-1893). Philosophy is represented by Lamennais (1782-1854), Victor Cousin (1792-1867), Jouffroy (1796-1842), Rémusat (1797-1875), Auguste Comte (1798-1857), Quinet (1803-75), Montalembert (1810-70), Renan (1823-1892). Among the writers on political economy and sociology are Bastiat (1801-50), Tocqueville (1805-59), Chevalier (1806-79), Proudhon (1809-65), Jules Simon (1814-1896), Prévost Paradol (1829-70). Among scientific writers are: Etienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, Duméril, in natural science; Gay-Lussac, Bichat, Corvisart, Magendie, in chemistry and medicine; and Lagrange, Laplace, and Arago in mathematics. Amongst Orientalists of note are Champollion, Burnouf, Silvestre de Sacy, and Stanislas Julien. The essayists and literary and art critics are legion. We can only mention by name Théophile Gautier, Jules Janin, Philarète Chasles, Léon Goslan, Paul de St. Victor, Gustave Planche, and St. René Taillandier. Among poets who belong to a date posterior to the Romantic movement, or show different tendencies, may be mentioned Gautier in his later poetry, Charles Baudelaire, Leconte de Lisle, Francois Coppée, Paul Verlaine, Stéphane Mallarmé, Sully Prudhomme, and Catulle Mendes.

France, Isle of (*Ile-de-France*), an ancient province of France, so called because it was originally bounded by the Seine, Marne, Ourcq, Aisne, Oise, and formed almost an island.

France, Isle of. See *Mauritius.*

France, Jacques Anatole Thibault, French novelist, born in Paris in 1844. Among his best-known works are *Le Crime de Sylvestre Bonnard* (1881), *Thais* (1890), *Le Mannequin d'Osier* (1893), and *L'Histoire Contemporaine*, the fourth volume of which treats of the Dreyfus affair.

Francesca da Rimini (fràn-ches'kà dà rē'mi-nē), an Italian lady, daughter of Guido da Polenta, lord of Ravenna, lived in the latter part of the thirteenth century. She was married to Lanciotto, the deformed son of the lord of Rimini, who, discovering an intimacy between her and his brother Paolo, put both to death. The story is a favorite theme with poets.

Franche-Comté (fraŋsh-koŋ-tā), an ancient province of France, forming at present the departments of Doubs, Haute-Saône, and Jura. It formed part of the Kingdom of Burgundy.

Franchise (fran'chiz), in a general and legal sense, a particular privilege or right granted by a prince, sovereign, or government to an individual, or to a number of persons. In politics, in regard to which the term is most commonly used, it is the right of voting upon proposed legislative measures, where such measures are accepted or rejected by the people generally; or for representatives to a legislative assembly (the parliamentary franchise) or to a municipal body.

Francia (fràn'se-à José Gaspar Rodriguez, Dictator of Paraguay, born in 1758; died in 1840. When Paraguay threw off the Spanish yoke, he became secretary of the junta appointed by congress. In 1814 he was appointed dictator for three years, and in 1817 he was continued in authority for life. He did much to consolidate the new republic;

but his rule was arbitrary in the extreme. In spite of his cruelty and rigor he was generally beloved by his subjects.

Francis I (fran'sis), King of France, was born 1494; died 1547. His father was Charles of Orleans, Count of Angoulême, and his mother Louise of Savoy, granddaughter of Valentine, Duke of Milan. He ascended the throne in 1515, having succeeded his uncle, Louis XII. In prosecution of his claim to Milan he defeated the Swiss in the plains of Marignano and forced the reigning duke Maximilian Sforza to relinquish the sovereignty. On the death of Maximilian (1519) Francis was one of the com-

Francis I.

petitors for the empire; but the choice fell on Charles of Austria, the grandson of Maximilian, henceforth known as the Emperor Charles V. From this period Francis and Charles were rivals, and were almost continually at war with one another. Both attempted to gain the alliance of England. With this view Francis invited Henry VIII of England to an interview, which took place near Calais, between Guines and Ardres, in June, 1520. The magnificence of the two monarchs and their suites on this occasion has given to the meeting the name of the Field of the Cloth of Gold. In 1521 war broke out between the rivals, which ended in Francis being defeated and taken prisoner. He could recover his liberty only by renouncing his claims to Naples, Milan, Genoa, and Asti, the suzerainty of Flanders and Artois, and promising to cede the Duchy of Burgundy and some other French fiefs. War was soon after renewed, an alliance, called the Holy League, having been formed between the Pope Clement VII, the King of France, the King of England, the Republic of Venice, the Duke of Milan, and other Italian powers, with the object of checking the advances of the emperor. In this war Rome was taken and sacked by the Constable of Bourbon (1527), and Italy was devastated, but Francis gained little either of fame or material advantage. Peace was concluded in 1529, but hostilities again broke out in 1535, when Francis possessed himself of Savoy. A hastily-made-up peace was soon broken, and Francis again found himself at war with the Emperor and the King of England. Fortunately for France the union of the Protestant princes of Germany against the emperor prevented him from following up his success, and inclined him to a peace, which was concluded at Crespy in 1544. Charles resigned all his claims on Burgundy, and allowed Francis to retain Savoy. Two years after peace was made with England. Francis I possessed a chivalric and enterprising spirit, and was a patron of learning.

Francis II, King of France, son of Henry II and Catharine of Medici, born at Fontainebleau in 1544, ascended the throne on the death of his father, 1559. The year previous he had married Mary Stuart, only child of James V, King of Scotland. The uncles of his wife, Francis, Duke of Guise, and the Cardinal of Lorraine, held the reins of government. Francis, who was of a feeble constitution, died in 1560.

Francis I, Emperor of Germany, eldest son of Leopold, Duke of Lorraine, was born in 1708. In 1736 he married Maria Theresa, daughter of the Emperor Charles VI. After the death of Charles VI (1740) he was declared by his wife co-regent of all the hereditary states of Austria, but without being permitted to take any part in the administration. After the death of Charles VII he was elected emperor in 1745. He died in 1765. See *Maria Theresa.*

Francis I, Emperor of Austria, (previously Francis II, emperor of Germany), was born in 1768; died in 1835. He was the son of the Emperor Leopold II and Maria Louisa, daughter of Charles III, King of Spain. He succeeded his father in 1792. France declared war against him in 1792, and hostilities continued till the Peace of Campo-Formio 1797. In 1799 he entered into a new coalition with England and Russia against the French republic; but in 1801 Russia and Austria were compelled to conclude the Peace of Lunéville.

France having been declared an empire in 1804, he assumed the title of *hereditary Emperor of Austria;* and on the establishment of the confederacy of the Rhine in 1806 he renounced the title of Emperor of Germany. In 1805 war again broke out between Austria and France. But after the battle of Austerlitz (1805) the Peace of Presburg was signed. In 1809 he again took up arms against France, and in the Peace of Vienna was compelled to surrender 42,000 square miles of territory. The marriage of his daughter, Maria Louisa, with Napoleon promised to form a strong tie between the imperial houses, but in 1813 he entered into an alliance with Russia and Prussia against France, and was present to the close of the contest.

Francis, OF ASSISI, ST., founder of the Franciscans, was born at Assisi, in Umbria, in 1182, where he died in 1226. In youth Francis did not refrain from the pleasures of the world; but after a serious illness he became enthusiastically devout, left the paternal roof, and in 1208 gave himself to a life of the most rigorous poverty. His followers were at first few, but when they reached the number of eleven he formed them into a new order, made a rule for them, and got it sanctioned, though at first only verbally, in 1210, by Pope Innocent III. In 1212 he received from the Benedictines a church in the vicinity of Assisi, which now became the home of the order of Franciscans or Minorites. Francis afterwards obtained a bull in confirmation of his order, from Pope Honorius III. After an unsuccessful attempt to convert the Sultan Meledin he returned to Assisi, when the order of St. Clara was founded under his direction, and a third order, called the Tertiaries, designed for penitents of both sexes. He was canonised by Pope Gregory IX in 1228. His festival is on the 4th of October. See *Franciscans.*

Francis, OF PAULA, ST., was born in 1416 in the city of Paula, in Calabria; died in France 1507. He was brought up in a Franciscan convent, and in 1436 founded a new order, which, when the statutes were confirmed by Alexander VI, received the name of the *Minims* (Latin, *minimi*, the least). To the three usual vows Francis added a fourth, that of keeping the Lenten fast during the whole year. The fame of his miraculous cures reached Louis XI of France, who invited him to France, in the hope that Francis would be able to prolong his life. After the death of Louis Charles VIII built him a monastery in the park of Plessis-lez-Tours and also at Amboise, and loaded him with honor and tokens of veneration. Twelve years after his death he was canonised by Leo X, and the Catholic Church celebrates his festival April 2. See *Minims.*

Francis, JOSEPH, inventor, was born in Boston, Massachusetts, in 1801, died in 1893. At the age of eighteen he received a prize for a fast rowboat. His greatest achievements were in the construction of life-saving appliances. He made the first use of iron floating vessels. He received numerous patents, medals and decorations, and the thanks of Congress for services to his country.

Francis, PHILIP, poet and dramatist, was born in Dublin 1700, died 1773. Educated at Dublin, he took orders, and kept an academy at Esher, Surrey, where Gibbon was one of his pupils. He was latterly chaplain to Chelsea Hospital. He is best known from his translations of Horace and other classic authors.

Francis, SIR PHILIP, one of the many political writers to whom the authorship of *Junius's Letters* has been ascribed, was the son of the preceding, born in Ireland in 1740, died 1818. In 1773 he went to the East Indies, where he became a member of the council of Bengal, and the constant opponent of Warren Hastings. In 1781 Francis returned to England, and shortly after was chosen member of parliament for the borough of Yarmouth in the Isle of Wight. He took a prominent part in the impeachment of Hastings. He published several political pamphlets. See *Junius.*

Franciscans (fran-sis'kans) are the members of the religious order established by St. Francis of Assisi about 1210. They are also called Minorites, or Fratres Minores ('lesser friars'), which was the name given them by their founder in token of humility, and sometimes Gray Friars, from the color of their garment. The order was distinguished by vows of absolute poverty and a renunciation of the pleasures of the world, and was intended to serve the church by its care of the religious state of the people. The rule of the order destined them to beg and to preach. The popes granted them extensive privileges, and they had an evil repute as spies, frequenting the courts of princes and the houses of noblemen, gentry, etc. Early in the fifteenth century they split up into two branches, the Conventuals and the Observants or Sabotiers. The former went barefooted, wore a long gray cassock and cloak and hood of large

dimensions, covering the breast and back, and a knotted girdle. The Observants wore wooden sandals, a cassock, a narrow hood, a short cloak with a wooden clasp, and a brown robe. In France the members of the order not belonging to any particular sect are called Cordeliers, from the cord which they tie about them. The Capuchins, so called from the peculiar kind of hood or cowl (*capuce*) which they wear, originated in a reform introduced among the Observantists by Matthew of Baschi in the early part of the sixteenth century, and although it received the approbation of different popes within a short time after its foundation, it did not receive the right of electing a particular general and become an independent order till 1619.

Franciscan or Gray Friar (Conventual).

St. Francis himself collected nuns in 1209. St. Clara was their prioress; hence they were called the *nuns of St. Clara*. The nuns were also divided into branches, according to the severity of their rules. The Urbanists were a branch founded by Pope Urban IV; they revered St. Isabelle, daughter of Louis VIII of France, as their mother. St. Francis also founded in 1221 a third order, of both sexes, for persons who did not wish to take the monastic vows, and yet desired to adopt a few of the easier observances. They are called Tertiarians or Tertiaries, and were very numerous in the thirteenth century.

Francis Joseph I, Emperor of Austria and King of Hungary, born 1830; succeeded his uncle, Ferdinand, who abdicated in 1849. The chief events of his reign were the cession of Lombardy to Italy, as a result of the Austro-French war (1859); the loss of Venetia, as also of Austria's important influence in Germany, the result of the war with Prussia (1866); and the annexation of Bosnia and Herzegovina (1908). See Austria. He died Nov. 21, 1916.

Francis-Joseph Land. See *Franz-Joseph Land*.

Francis of Sales, St. See *Sales*.

Francis Xavier, St. See *Xavier*.

Francke (fräṅ'kė), August Hermann, German theologian and philanthropist, born at Lübeck 1663; died at Halle 1727. He was professor of Oriental literature and then of theology at Halle, but is chiefly known for his successful labors on behalf of poor orphans. In 1695 he founded the famous orphanage at Halle, still known by his name, which now includes, besides the orphan asylum, a great variety of schools, a printing and publishing establishment, chemical laboratory, etc.

Franco-German War. The immediate occasion of this war was an offer made in June, 1870, by General Prim, then at the head of affairs in Spain, of the crown of that country to Leopold of Hohenzollern, a prince belonging to the reigning house of Prussia. The government of Napoleon III demanded of the King of Prussia that he should forbid the candidature of the prince, and when the prince voluntarily retired from his candidature, still insisted that this renunciation should be formally made by the king, and a guarantee given that the candidature would not be revived. This demand was refused, and a formal declaration of war by France against Prussia was received by Count Bismarck, the Chancellor of the North German Confederation, on the 19th of July. The French were the first in getting their troops to the frontier, but it soon became manifest that instead of being in a complete state of readiness for war, as the minister of war had declared, the French army was defective in almost everything essential to the equipment of an army.

In Germany everything formed a complete contrast to this state of affairs. Each section of the army was completely organized in the headquarters of the district which it occupied in time of peace, and was only sent to the frontiers after being furnished with everything it required. In addition to this Prussia,

against which country alone the war had been declared, was not only joined, according to treaty, by all the states of the North German Confederation, but also by those of the South, upon whose neutrality, perhaps even upon whose alliance, Napoleon and the French had counted.

Thus instead of the French army making a march of conquest through Germany, as was the expectation of the enthusiastic populace of Paris, the German army, moving with remarkable promptitude, was quickly on the soil of France and winning victories over the poorly prepared French. It was divided into three sections, respectively under the command of General Steinmetz, Prince Frederick Charles, and the Crown Prince of Prussia, King William, aided by the famous strategist Von Moltke and a staff of general officers, being in general command. Victories won at Weissenburg on August 4 and at Wörth and Forbach on the 6th, put the whole French line in retreat. Bazaine with the northern army was overtaken and defeated at Courcelles on the 14th and again at Marsles-Tour and Gravelotte, after which he took refuge behind the fortifications of Metz, where he was besieged by the army under Prince Frederick Charles. Meanwhile the Crown Prince had advanced as far as Nancy, where he awaited reinforcements before engaging MacMahon, who had reached Chalons with a strong army. The advanced detachments of the two armies met on August 27, and a series of engagements and strategic movements ensued, to the advantage of the Germans, the result being that on the 1st of September MacMahon, with whom was the French emperor, was surrounded at Sedan by a force of overwhelming strength. The position of the army was hopeless and on the following day the troops and fortress were surrendered, 50 generals, 5000 other officers and 84,000 soldiers becoming prisoners of war,—among them Napoleon III. The only army now left to France was that of Bazaine, then closely besieged at Metz and this, unable to escape, capitulated on the 20th of October.

The first result of the surrender at Sedan was an outburst of rage of the Parisians against the Napoleonic dynasty, a republic being proclaimed on September 4 and a government of national defense formed, with General Trochu at its head. By September 19 the German army reached and invested Paris, in such force that the utmost efforts of the French could not relieve their capital city. It held out longer than could have been expected under the circumstances, but the repulse of the last sally, on January 19, showed that a capitulation was inevitable, and on the 21st of February M. Thiers, executive of the new republic, arrived at Versailles with a diplomatic commission. Preliminaries of peace were signed on February 26 and accepted by the assembly at Bordeaux on March 1. The principal terms were the following: 1. That France should cede to Germany one-fifth part of Lorraine, including Metz, together with the whole of Alsace except Belfort and the surrounding district. 2. That France should pay to Germany a war indemnity of five milliards of francs ($1,000,000,000). 3. That certain departments of France should remain in the occupation of the Germans, and should not be fully evacuated until after the payment of the whole indemnity. The definitive treaty of peace, which was signed at Frankfort on the 10th of May, and ratified on the 21st, confirmed in all essential particulars the preliminaries of Versailles. The last installment of the war indemnity was paid on the 5th of September, 1873, and France was completely evacuated by the Germans on the 13th of the same month.

François (fräṅ-swä), St., a town in the French West Indies, in the island of Guadeloupe. Pop. about 6000.

Francolin (fran'ko-lin), a genus of birds belonging to the same family with the partridge, which they resemble in many respects, though they usually have one or more strong and sharp horny spurs on the tarsi. The only European member of the genus is the *Francolinus vulgāris*, which is characterized by a red band round the neck, and red feet. It is found in the south of France, Sicily, Cyprus, and the southern part of Europe generally. The other species are found in Africa, Asia, and Oceanica.

Franconia (fran-kō'ni-a; in German, *Franken*, so called because early in the sixth century it was colonized by Franks), a district of Germany lying to the east of the Rhine, and traversed by the Main. After the dismemberment of the Carlovingian Empire this district became attached to the German division, and ultimately formed one of the grand-duchies of Germany. In 1806 it was partitioned among Würtemberg, Baden, Hesse-Cassel, the Saxon duchies, and Bavaria. The last received the largest share, now forming the three divisions of Upper, Middle, and Lower Franconia.

Franconian Wines, German wines produced chiefly

ly in the Bavarian district of Lower Franconia. The chief sorts are known as *Leistenwein* and *Steinwein*.

Franc-tireur (frăn-tē-reur), lit. a free shooter: an irregular sharpshooter, one of a body of soldiers organized in France in the war of 1870, and employed in guerrilla warfare for harassing the enemy, cutting off detachments, etc.

Franeker (frän'ek-ėr), a town in Holland, in the province of Friesland, on a canal communicating with the sea at Harlingen. It was long celebrated as the seat of a school of theology. Pop. 7187.

Frangipani (fran-ji-pū'nē), a perfume invented by the Marquis Frangipani, Maréchal des Armées of Louis XIII of France. It was a powder composed of every spice then known, with the addition of ground orris-root and musk. It is now a perfume prepared from, or imitating the odor of, the flower of a West Indian tree, *Plumiera rubra*, or red jasmine.

Frangulin (fran'gu-lin; $C_6H_6O_3$), a yellow, crystallizable coloring matter contained in the bark of the berry-bearing alder (*Rhamnus Frangula*. It is a bright-yellow, silky, crystalline mass, without taste or smell, which fuses on heating, and can be sublimed in golden needles. It dyes silk, wool, and cotton.

Frank, the signature of a person possessing the privilege of sending letters free of postage. This privilege was formerly enjoyed by members of congress and the highest officials of the Government, but it was greatly abused and by act of Congress, taking effect July 1, 1873, the privilege was entirely abolished. Envelopes with a notice of the penalty incurred by using them except for official purposes are now exclusively used. The use of these for public documents was restored to members of Congress in 1875 and to other officials of the government at later dates, there being a penalty for the use of the official envelope for private matter.

Frankalmoigne (-moin), literally 'free alms,' an English mode of tenure according to which a religious corporation held lands without being required to perform any but religious services, such as praying for the souls of the donors. This is the tenure by which almost all the ancient monasteries and religious houses held their lands, and by which the parochial clergy and very many ecclesiastical and eleemosynary foundations hold them to this day, the nature of the service being, upon the Reformation, altered and made conformable to the reformed church.

Frankenberg (frank'en-burg), a German town, kingdom of Saxony, 40 miles S. E. of Leipsig. It is regularly built, and has extensive manufactures of woolens, cottons, and silks, etc. Pop. 12,726.

Frankfort (frank'fort), a city, county seat of Clinton Co. Indiana, 24 miles E. S. E. of Lafayette, in an agricultural section. It has large machine shops, railroad shops and manufactories of furniture, brickmaking machines, etc. Pop. 8634.

Frankfort, a city, capital of Kentucky and of Franklin Co., is situated on both banks of Kentucky River, 65 miles E. of Louisville. The public buildings, comprising the State-house, State penitentiary, and various institutions, are handsome, and the scenery around the city is notable for picturesque beauty. It has sawmills and various manufactures, and a large lumbering trade. Pop. 10,465.

Frankfort-on-the-Main (German, *Frank'furt am Main*), a town of Prussia, in the province of Hessen-Nassau, 20 miles N. E. of Mayence (Mainz). It was formerly a free town of the empire, and down to 1866 one of the free towns of the German Confederation and the seat of the diet. It is mainly situated on the right bank of the Main, but has the suburb of Sachsenhausen on the left bank, the river being crossed by seven bridges. The north or right bank of the river is lined by a spacious quay. The older part of the town contains a number of ancient houses, and largely consists of narrow and unattractive streets, but the principal street, the Zeil, and those of the newer parts of the town, are spacious and have many handsome modern buildings. The older portion is surrounded by the Anlagen or promenade with gardens, on the site of the old fortifications. Fronting this promenade and in the districts outside of it are many very handsome, and some palatial, private residences with gardens. The Römerberg and the Ross-markt (horse-market) are the chief squares in the town. The Römer or town-house was erected about 1405, but not completed in its present form till 1740. In one of its halls, the Wahlzimmer, the electors of the empire met and made their arrangements for the election of the emperor, and the Senate of Frankfort held its sittings. In another, the Kaisersaal, the emperor was banqueted after his election, and waited on at table by kings and princes. The

most remarkable of the churches is the Dom or Cathedral of St. Bartholomew (R. Catholic), in which the German emperors after 1711 were crowned. It is a Gothic edifice, begun in 1238. The choir was built in 1315-18. The building was seriously injured by fire in 1867, but has been completely restored, the tower left incomplete since 1514 being finished in accordance with the original plans. Other buildings are the new opera-house, one of the finest buildings of the kind; the courts of justice, of modern construction; the new exchange, a spacious and handsome edifice; the large palace of the Prince of Thurn and Taxis; the new railway-station, a very elegant edifice, which will favorably compare with any similar structure; the archive-building, postoffice, the house in which Luther dwelt, and that in which Goethe was born. There are monuments to Gutenberg, Goethe, Schiller, and others. Frankfort is rich in collections connected with literature and art, and in establishments intended to promote them. The chief of these are the Historical Museum (in the archive-building), the Städel Art Institute (in Sachsenhausen, containing a fine gallery of pictures and other collections; the Senckenberg Museum of Natural History; the town library, possessing over 150,000 printed volumes. There is also a zoological garden and the Palm Garden, both favorite places of resort. The manufactures comprise chemicals, ornamental articles of metal, sewing machines, straw hats, soap, perfumery, beer, etc. A great business is done in money and banking. The town is provided with tramways, is a great railway center, and is now reached by the largest vessels navigating the Rhine. Frankfort dates from the time of Charlemagne. It was made an imperial free city by a decree of the Emperor Louis V in 1329. Frederick Barbarossa had been elected emperor here in 1152, and in 1356 the right of being the place of election for all future emperors was granted to it by the Golden Bull. Frankfort suffered severely in the Schmalkald war (1552), the Thirty Years' war (1635), the Seven Years' war (1762), and during the French wars (1792, 1796, 1799, 1800, 1806). Under Napoleon it became the capital, first of a principality, and then, in 1806, of a grand-duchy. From 1814 to 1866 it was one of the four free cities of the German Confederation, and in 1866 it was taken by the Prussians. Population (1910) 414,376.

The new Opera-house, Frankfort.

Frankfort-on-the-Oder (*Frank'furt an der Oder*), a town of Prussia, province of Brandenburg, on the Oder, 52 miles E. S. E. Berlin. It is built with considerable regularity, and is an important military center. Many retired officers and government officials take up their residence here. The manufactures consist of machinery and metal goods, chemicals, leather, earthenware, spirits, etc.; and the trade is extensive both by land and water. Frankfort was annexed to Brandenburg in 1250, and notwithstanding its repeated captures during the Hussite, the Thirty Years', and the Seven

Years' wars, was always an important commercial place. Pop. (1910) 68,235.

Frankincense (frangk'in-sens), a name given to the oleoresinous exudations from different species of conifers. American frankincense is got as a soft, yellow, resinous solid, with a characteristic turpentine odor, from *Pinus Tæda*. Another kind is exuded by the spruce fir, and forms a soft solid, the color of which varies from white to violet red. From this Burgundy pitch is prepared by melting in water and straining through a cloth. The frankincense employed in religious ceremonies (called also *incense* and *olibânum*) is a gum-resin obtained from *Boswellia thurifera* (or *serrâta*), a tree somewhat resembling the sumach, belonging to the Amyridaceæ, and inhabiting the mountains of India. It comes to us in semi-transparent, yellowish tears, or sometimes in masses, of specific gravity 1.22, and possesses a bitter and nauseous taste.

Franklin (frank'lin), a village of Franklin town (township), Norfolk Co., Massachusetts, 27 miles S. W. of Boston. It is the site of Dean Academy, and has extensive manufactures of woolen goods, also pianos, straw, and cotton goods. Pop. 5641.

Franklin, a city of Merrimac Co., New Hampshire, on the Merrimac River, 19 miles N. N. W. of Concord. Its manufactures include needles, knitting machines, flannel, paper, hosiery, etc. Known as Salisbury, it was the birthplace of Daniel Webster. Pop. 6132.

Franklin, a city, capital of Venango Co., Pennsylvania, on the Allegheny River at the mouth of French Creek, 9 miles S. W. of Oil City, it being the center of the chief oil region of the State. Natural gas is also abundant. It has oil refineries and manufactures of iron and steel, oil-well supplies, bricks and lumber. Pop. 9767.

Franklin, BENJAMIN, an American writer and statesman, born at Boston in 1706; died at Philadelphia in 1790. He was placed with his brother, a printer, to serve an apprenticeship to that trade, and his brother having started the *New England Courant*, Franklin secretly wrote some pieces for it, and had the satisfaction to find them well received. But, on this coming to the knowledge of his brother, he was severely lectured for his presumption, and treated with great harshness. Soon after he quitted his brother's employment, and at the age of seventeen started for Philadelphia, where he obtained employment as a compositor. Here he attracted the notice of Sir William Keith, the Governor of Pennsylvania, who induced him to go to England for the purpose of purchasing types to establish himself in business, and when there left him to shift for himself. He got work in a printing office, and after a residence of eighteen months in London came back to Philadelphia. Here he returned to his trade, and in a short time formed an establishment of his own, in connection with a person who supplied the necessary capital. They printed a newspaper, which was managed with much ability, and gave Franklin much reputation. By his exer-

tions a public library, improved systems of education, a scheme of insurance, etc., were established in Philadelphia. In 1732 he published his *Poor Richard's Almanack*, which continued to be issued till 1757. Being in Boston in 1746 he saw, for the first time, some experiments in electricity, which led him to begin those investigations which resulted in the identification of lightning and electricity, and the invention of the lightning-conductor. As a member of the provincial assembly of Pennsylvania he displayed much ability in political affairs, and in 1757 was sent to England as an agent of the province. His reputation was now such, both at home and abroad, that he was appointed agent of the provinces of Massachusetts, Maryland, and Georgia. Oxford and Edinburgh conferred on him their highest academical degrees for his electrical researches, and the Royal Society elected him a fellow. In 1762 he returned to America; but was again appointed agent in 1764, and brought to England a remonstrance against the project of taxing the colonies. He opposed the stamp-act, and in 1774 presented to the king the petition of the first American Congress. On his return he was

elected a member of the Congress, and exerted all his influence in favor of the Declaration of Independence. In 1776 he was sent to France as commissioner plenipotentiary, to obtain supplies from that court. After the surrender of Burgoyne he concluded with France the first treaty of the new states with a foreign power (1778), and was subsequently named one of the commissioners for negotiating the peace with the mother country. On his return to his native country he filled the office of president of Pennsylvania, and served as a delegate in the Constitutional Convention of 1787, and approved the Constitution then formed. His works include his unfinished *Autobiography*, and a great number of political, antislavery, financial, economic, and scientific papers. With Washington, he ranks as one of the two greatest and ablest men the United States has yet produced.

Franklin, Sir John, an English Arctic voyager, born in Lincolnshire in 1786; died near Lancaster Sound, in 1847. He entered the navy as a midshipman at the age of fourteen, and was present at the battle of Copenhagen in 1801. He afterwards accompanied Captain Flinders on his voyage to the coast of Australia (1801-03). Shortly after his return he was appointed to the *Bellerophon*, and had charge of her signals during the battle of Trafalgar. Two years later he joined the *Bedford*, which was employed successively in the blockade of Flushing, on the coast of Portugal, and on the coast of America. On the last station he took part in the attack on New Orleans in 1814 and was slightly wounded. His Arctic work began in 1818 when he conducted an overland expedition for the exploration of the north coast of America from Hudson Bay to the mouth of Coppermine River. On his return to England he published a narrative of the expedition, was promoted to the rank of captain, and elected a F. R. S. In a second expedition he surveyed the coast from the mouth of the Coppermine west to Point Beechy, thus traversing in his two expeditions about a third of the distance between the Atlantic and the Pacific. On his return in 1827 he received the honor of knighthood. After serving for some years in the Mediterranean he held the post of governor of Tasmania from 1836 to 1843. In 1845 he took command of the *Erebus* and *Terror* in what proved his last polar expedition. The problem was the discovery of an Arctic waterway between the Atlantic and the Pacific. The expedition was seen in Melville Bay two months later, but from that time no direct tidings were received from it. Many expeditions were sent in search of him both from Britain and America, but with little success. At last an expedition, sent out under McClintock in 1857, discovered in 1859, at Point Victory, in King William's Land, a document which had been deposited in a cairn thirteen years before, and gave the latest details of the ill-fated expedition. This paper stated that Sir John died 11th June, 1847; that the ships were abandoned in April, 1848; and that the crews, 105 in number, had started for the Great Fish River. None survived, but many relics of the party have been recovered by later expeditions.

Franklin, William Buells, soldier, born at York, Pennsylvania, in 1823; died in 1903. He graduated at West Point Academy in 1843, served under General Taylor in the Mexican War as a topographical engineer, and became a brigadier-general of volunteers at the outbreak of the Civil War. He was in the battle of Bull Run and the Peninsular campaign and was promoted major-general in 1862. He served during the rest of the war, was breveted major-general in the regular army in 1865, but soon resigned to engage in business. He was U. S. Commissioner General to the Paris Exposition of 1889.

Franklinite (frank'lin-it), a mineral composed of oxide of iron 64.5 to 66, oxide of zinc 21.8, and oxide of manganese 12.23 to 13.5, and is therefore considered as belonging to the group of minerals called *spinels*. It is found in New Jersey and named after Dr. Franklin.

Frank-pledge, literally pledge or surety for a freeman. Frank-pledge was a law prevailing in England before the Norman conquest, by which the members of each decennary or tithing, composed of ten households, were made responsible for each other, so that if one of them committed an offense the others were bound to make reparation.

Franks, a Germanic tribe or aggregate of tribes which overthrew the Visigoths and Burgundians in Gaul, and gave origin to the name France. See *France*.

Franzensbad (frants'ens-bät), a watering-place in Bohemia, about 3 miles north of Eger. The mineral springs are alkaline, saline, and chalybeate, and are very efficacious, particularly in scrofulous and cutaneous affections. Pop. 2330.

Franz-Joseph Land, an island group in the Arctic Ocean, lying north of Nova Zem-

bia, and consisting of two chief islands, much broken up by fiords, and a number of smaller ones.

Franzos (fränt'sōs), KARL EMIL, novelist, born at Podolia, Austria, in 1848, of Jewish parentage. His first literary work, *Simé Asia: Pictures of Life in Galicia, Bukowina, Southern Russia and Rumania*, was a brilliant success and was widely translated. It was followed by many novels and romances, including *Mein Frans, Der Präsident, Tragische Novellen*, etc.

Frascati (fras-kä'tē), a town of Italy, about 10 miles S. E. of Rome, situated on the slopes of the Alban Hills, near the site of the ancient Tusculum. It is much resorted to by the Romans in the summer season. Charles Edward Stuart, the Young Pretender, is buried here, in the Cathedral of S. Pietro. Pop. 9915.

Fraser (frā'ser), ALEXANDER CAMPBELL, a Scottish philosophical and miscellaneous writer, born in 1819. He succeeded Sir William Hamilton in the professorship of logic and metaphysics in the University of Edinburgh, 1856. From 1850 to 1857 he edited the *North British Review*, and published *Essays in Philosophy*, 1856; *Rational Philosophy*, 1858; and a collected edition of the works of Bishop Berkeley.

Fraser, SIMON. See *Lovat.*

Frasera (frā'sėr-a), a genus of plants, nat. order Gentianaceæ, containing seven species of erect perennial herbs, natives of North America. *F. Carolinensis* is indigenous in the swamps of the Carolinas. The root yields a powerful bitter, wholly destitute of aroma. In its medicinal effects it is equal to gentian, and when fresh is said to be emetic and cathartic.

Fraserburgh (frā'sėr-burg), a seaport of Scotland, in Aberdeenshire, 22 miles east of Banff. It is substantially built, and has a town-hall, a market-cross, building-yards, and two harbors. Fraserburgh is the chief seat of the Scotch herring-fishery. Pop. 9715.

Fraser River, the principal river in British Columbia, rising in the Rocky Mountains. It first flows northwest for about 270 miles, then turns south, and after a total course of about 500 miles falls into the Gulf of Georgia. Gold is found on both the Fraser and its affluents, and the salmon fisheries are important. Its principal affluents are the Thomson, Quesnelle, and Stuart rivers. New Westminster, Hope, Yale, and Lytton are on its banks.

Fraserville (frā'zėr-vil), a town in Quebec, Canada, on the St. Lawrence. Pop. (1911) 6774.

Fratercula (fra-tėr'ku-la), a genus of web-footed birds, containing the puffins (which see).

Fraternal Societies, organizations devoted to social intercourse and to mutual benefit. They are numerous in modern nations, many of those of England having made their way to the United States, while others have originated in this country. Their obligations usually include the payment of sick and death benefits and fraternal care of sick members. In some of them the lodge principle prevails and social features are prominent. Among them are the Odd Fellows, Free Masons, Knights of Pythias, Order of Red Men, Artisans, etc.

Fraternities (fra-tėr'na-tēs), a voluntary association of men for promoting their common interest, business or pleasure. In this wide sense it includes all secret and benevolent societies, the monastic and sacerdotal congregations, the orders of knighthood, and also guilds, trades-unions, and the like. In a limited sense it is applied to religious societies for pious practices and benevolent objects. Fraternities were often formed during the middle ages, from a desire of imitating the holy orders. Many of these societies, which did not obtain or did not seek the acknowledgment of the church, had the appearance of separatists, which subjected them to the charge of heresy. The pious fraternities which were formed under the direction of the church, or were acknowledged by it, were either required by their rules to afford assistance to travelers, to the unfortunate, the distressed, the sick, and the deserted, on account of the inefficiency of the police, and the want of institutions for the poor, or to perform certain acts of penitence and devotion. Of this description were the Fratres Pontifices, a brotherhood that originated in Tuscany in the twelfth century, where they maintained establishments on the banks of the Arno, to enable travelers to cross the river, and to succor them in case of distress. A similar society was afterwards formed in France, where they built bridges and hospitals, and provided for the security of the highways. Similar to these were the Knights and Companions of the Santa Hermandad (or Holy Brotherhood) in Spain; the Familiars and Crossbearers in the service of the Spanish Inquisition; the Calendar Brothers in Germany; the Alexians in Germany, Poland, and the

Netherlands, etc. The professed object of the Alexians, so called from Alexius, their patron saint, was to visit the sick and imprisoned; to collect alms for distribution; to console criminals, and accompany them to the place of execution; to bury the dead, and to cause masses to be said for those who had been executed or for persons found dead. There were also Gray Penitents (an old fraternity of an order existing as early as 1264 in Rome, and introduced into France under Henry III), the black fraternities of Mercy and of Death; the Red, the Blue, the Green, and the Violet Penitents, so called from the color of their cowl; the divisions of each were known by the colors of the girdle or mantle. The fraternity of the Holy Trinity was founded at Rome in 1548 by Philip de' Neri for the relief of pilgrims and the cured dismissed from the hospitals. The Brothers and Sisters of Charity are another fraternity whose hospitals are found in all the principal cities of Catholic Christendom.

Fraticelli (frâ-ti-chel'lē; the diminutive plural of Italian, *frate*, brother or monk), the name given about the end of the thirteenth and during the fourteenth century, and even later, to wandering mendicants of different kinds, but especially to certain Franciscans, who pretended to practise the rules of their order in their full rigor. They claimed to be the only true church, and denounced the pope, whose authority they threw off, as an apostate. They made all perfection consist in poverty, forbade oaths, and discountenanced marriage, and were accused by their opponents of very lewd practices. The sect is said to have continued till the Reformation which its members embraced.

Frattamaggiore (frât-tâ-mâ-jō'rā), a town of Italy, 6 miles N. E. of Naples. Manufactures ropes and silk. Pop. 13,170.

Fraud (frąd), an act or course of deception deliberately practised with the view of gaining an unlawful or unfair advantage, such as the obtaining of goods under false pretenses, and the like. All frauds or attempts to defraud, which cannot be guarded against by common prudence, are indictable at common law, and punishable arbitrarily according to the heinousness of the offense. Every species of fraud which the law takes cognizance of renders voidable every transaction into which it enters as a constituent material element. Fraud may be by false representation, concealment of material circumstances that ought to be revealed, underhand dealing, and by taking advantage of imbecility or intoxication. A constructive fraud in law is such fraud as is involved in an act or contract which, though not originating in any actual evil or fraudulent design, yet has a tendency to deceive or mislead other persons, or to violate public or private confidence, or to impair or injure the public interests. Gross criminal frauds are punishable by way of indictment or information; such as playing with false dice, causing an illiterate person to execute a deed to his prejudice, etc. Frauds are not indictable at common law unless they be such as affect the public, as using false weights and measures.

Fraunhofer (froun'hō-fĕr), Joseph von, a German optician, born in 1787, died in 1826. He ultimately became a partner in a manufactory of optical instruments at Munich. His many improvements in glassmaking, in optical instruments, and in the polishing of lenses have been eclipsed by his investigation of the innumerable dark fixed lines in the solar spectrum, known as *Fraunhofer's lines*. The importance of this discovery can scarcely be overestimated. It led to the invention and use of the spectroscope, to the science of spectroscopy, and to all our present knowledge of solar and stellar chemistry. See *Spectroscope*, *Spectrum*, etc.

Fraustadt (frou'stât), a town of Prussia, in the government of Posen, 15 miles northeast of Glogau. Pop. 7462.

Fraxinella (frak-si-nel'a), a species of dittany, the *Dictamnus Fraxinella*, an ornamental herbaceous annual plant, cultivated for its fragrant leaves and handsome rose-colored flowers.—*Dictamnus albus*, or common dittany, is also called fraxinella; its flowers are white.

Fraxinus (frak'sin-us), a genus of deciduous trees of the order Oleaceæ, containing the ash.

Fray Bentos (frī ben'tos) a small town of Uruguay, on the river Uruguay, about 170 miles northwest of Montevideo. It owes its existence to immense slaughter-houses and other establishments connected with the extract-of-meat trade. Pop. about 5000.

Frechette (frĕ-shet'), Louis Honoré, a French Canadian author, born at Levis, Quebec, in 1839. He was educated at Nicolet College and Laval University, studied law and was called to the bar of Lower Canada, represented his native country in the Dominion parliament (1874-79), contributed to various newspapers, and became editor of *La Patrie* in Montreal in 1884. He pub-

lished collections of poems entitled *Mes Loisirs*, *Les Fleurs Bordelaises* and *Les Oiseaux de Neige* (the two last crowned by the French Academy); the dramas *Félix Poutré* (1862), *Papineau* (1880), *The Thunderbolt* (1882), etc. In prose he wrote *Petite Histoire des Rois de France*, *Lettres à Basile*, etc.

Freckles (frek'lz) are small yellow or brownish-yellow spots of a circular form, situated in the middle layer of the skin and underneath the cuticle. They only appear to any appreciable extent on those surfaces exposed to the action of the sun, as the neck, face, hands, and arms. This affection is most common in persons of fair complexion and hair; in some cases it is permanent, but in most it disappears with the warm season.

Fredegonde (f r e d - a - g u n' d a), the w i f e of Chilperic, a Frankish king of Neustria, born 543; died 597. While in the service of the first and second wives of Chilperic her beauty captivated the king. In order to arrive at the throne Fredegonde got Andowena, the first wife of the king, removed by artifice, and the second (Galswintha) by assassination (568). This led to a war between Chilperic and his brother Sigebert, king of Austrasia, Brunehilde, wife of Sigebert and sister of the murdered queen, urging her husband to vengeance. Fredegonde found means to have Sigebert assassinated, captured Brunehilde and her daughters, and after a series of crimes, ending with the assassination of her husband, she seized the reins of government on behalf of her son Clothaire, and retained possession of them until her death.

Fredericia (fred-er-rish'i-a), a seaport and fortress of Denmark, in Jutland, at the north entrance of the Little Belt. In 1849 the army of Schleswig-Holstein was defeated here by the Danes, and in 1864 the Danes were compelled to evacuate it before the superior Austro-Prussian forces. Pop. 12,714.

Frederick (fred'er-ik), a city, capital of Frederick Co., Maryland, 61 miles w. of Baltimore. It has an extensive trade, chiefly in live stock, grain, flour, tobacco, wool, etc., and various manufactures. During the Civil War it was occupied on different occasions by the opposing armies. It is the scene of the exploit made famous by the poem of *Barbara Fritchie*. Pop. 10,411.

Frederick I, Barbarossa (or, as the Germans call him, Rothbart, both surnames meaning 'Redbeard'), German emperor, son of Frederick, duke of Suabia, was born 1121, and received the imperial crown in 1152 on the death of his uncle the Emperor Conrad III. His principal efforts were directed to the extension and confirmation of his power in Italy. In his first expedition to Italy in 1154 he subdued the towns of Northern Italy, and then got himself crowned at Pavia with the iron crown of Lombardy (April, 1155), and afterwards at Rome by Pope Adrian IV with the imperial crown (June, 1155). Soon after his return to Germany the Lombard cities revolted, and Frederick led a second expedition into Italy (1158), took Brescia and Milan, and at the diet of Roncaglia, at which all the cities and imperial vassals of Italy were represented, he assumed the sovereignty of the towns and received the homage of the lords. The rights assigned to the empire were so great that many of the cities refused to acknowledge them, and Milan especially prepared for resistance. Meantime Pope Adrian IV died (1159), and in electing a successor the cardinals were divided, one section choosing Victor IV and another Alexander III. Frederick supported Victor, and Alexander was compelled to flee from Italy and take refuge in France. Other expeditions into Italy were made in 1161 and 1166, in the latter of which Frederick at first carried everything before him, and was even able to set up in Rome the Antipope Paschalis III, whom he supported after the death of Victor IV. His successes were put an end to, however, by a terrible pestilence, which carried off a large part of his army, and compelled him hastily to return to Germany. Scarcely had he settled the most pressing difficulties here when he undertook, in 1174, a fifth expedition into Italy; but he was totally defeated in the battle of Legnano on the 29th of May, 1176, in consequence of which nearly all that he had won in Italy was again lost, and he was compelled to acknowledge Alexander III as the true pope. In 1188 he assumed the cross, and with an army of 150,000 men and several thousand volunteers set out for Palestine. After leading his army with success into Syria he was drowned in crossing the river Kalykadnus in 1190.

Frederick II, Hohenstaufen, grandson of the preceding, born 1194, was son of the Emperor Henry VI and of the Norman Princess Constance, heiress of the Two Sicilies. He remained under the guardianship of Innocent III till 1209, when he took upon himself the government of Lower Italy and Sicily. The imperial

crown of Germany was then worn by a rival, Otho IV, whose defeat at the battle of Bouvines opened the way to Frederick, who in 1215, after pledging himself to undertake a crusade, was crowned at Aix-la-Chapelle. He caused his eldest son Henry to be chosen king of Rome in 1220, and the same year received the imperial crown from the pope. His ambition aimed at the subjugation of Lombardy, the mastership of all Italy, and the reduction of the popes to their old spiritual office as the leading bishops in Christendom. This led him into constant struggles in Germany and Italy. In 1227 he undertook a crusade; but when he did reach the Holy Land he was able to effect nothing permanent, although he had crowned himself at Jerusalem as king of Judea. On his return he had to suppress a revolt of his son Henry, whom he imprisoned for life. In 1237 he broke the power of the Lombard League by a victory at Corte Nuova in Lombardy, and marched on Rome, but did not attack it. The remainder of his life was occupied with his troubles in Italy, and he died in the midst of his wars in 1250. He was one of the ablest and most accomplished of the long line of German emperors, and art, literature, commerce, and agriculture received every encouragement at his hands. He himself was a good linguist, was acquainted with natural history, was a minnesinger, and a writer on philosophy.

Frederick I, King of Prussia, son of the Great Elector, born 1657; died 1713. He succeeded his father as Elector of Brandenburg in 1688; became King of Prussia in 1700; and was all his reign bitterly opposed to France.

Frederick II, King of Prussia, known as Frederick the Great, born Jan. 24, 1712; died Aug. 17, 1786. He was the son of Frederick William I and the Princess Sophia Dorothea, sister of George II of England. Although he was instructed only in the details of military exercises and service, his taste for poetry and music was early developed. He was brutally treated by his father, and in 1733 he was obliged to marry the Princess Elizabeth Christina, daughter of Ferdinand Albert, duke of Brunswick-Bevern. Frederick William gave the castle of Schönhausen to her, and to the prince the county of Ruppin, and in 1734 the town of Rheinsberg, where he lived, devoting himself chiefly to literary pursuits, composing several works, and corresponding with foreign scholars, particularly with Voltaire, whom he greatly admired. The death of his father raised him to the throne in 1740, and it was not long before he asserted the claims of the house of Brandenburg to a part of Silesia then held by Maria Theresa. But his proposals being rejected, he occupied Lower Silesia in December, 1740, defeated the Austrians near Mollwitz, and at Czaslau (Chotusitz), and the First Silesian war was terminated by the peace signed at Berlin, July 28, 1742, leaving Frederick in possession of Silesia. Soon the Second Silesian war broke out, the result of which was equally favorable for Frederick. By the Peace of Dresden (December 15, 1745) he retained Silesia and acknowledged the husband of Maria Theresa, Francis I, as emperor. During the eleven following years of peace Frederick devoted himself to the domestic administration, to the improvement of the army, and at the same time to the muses. He encouraged agriculture, the arts, manufactures, and commerce, reformed the laws, increased the revenues of the state, and perfected the organization of his army, which was increased to 160,000 men. Secret information of an alliance between Austria, Russia, and Saxony gave him reason to fear an attack and the loss of Silesia. He hastened to anticipate his enemies by the invasion of Saxony (1756), with which the Seven Years' war, or Third Silesian war, commenced. This was a far more severe struggle than either of the former. In it Frederick had against him Austria, Russia, France, Sweden, and greater part of Germany, though Britain and some of the German states were on his side. He gained victories at Prague, Rossbach, Leuthen, Zorndorf, Toggau, and Freiberg, but suffered severe defeats in the battles of Kollin, Hochkirch and Kunersdorf. (See *Seven Years' War.*) The Peace of Hubertsburg (1763)) terminated this war, Frederick keeping Silesia and ceding nothing. Frederick came out of the Seven Years' war with a reputation which promised him, in the future, a decisive influence in the affairs of Germany and Europe. His next care was the relief of his kingdom, drained and exhausted by the contest. This he prosecuted with great diligence and liberality. On the partition of Poland in 1772 Frederick received a large accession to his dominions. In 1778-79 he frustrated the designs of the Emperor Joseph II on Bavaria, and the war of the Bavarian Succession was terminated without a battle by the Peace of Teschen (May 13, 1779). Austria consented to the union of the principalities of Franconia with Prussia, and renounced the feudal claims of Bohemia to these coun-

tries. In the evening of his active life Frederick concluded, in connection with Saxony and Hanover, the conference of the German princes, July 23, 1785. An incurable dropsy hastened the death of Frederick, who left his nephew, Frederick William II, a kingdom increased by 29,000 square miles, a well-filled treasury, an army of 200,000 men, great credit with all the European powers, and a state distinguished for population, industry, wealth, and science. Frederick's works, relating chiefly to history, politics, military science, philosophy, and the belles-lettres, were all written in French, the language which he regularly used, as he despised German. He was a man of the highest abilities, but in some respects narrow and repellant. Among his closest friends was the Scottish exile, Marshal Keith. Carlyle's *Life of Frederick the Great* is an able presentation of his career.

Frederick III, Emperor of Germany, born in 1831; succeeded William I March 9, 1888; died June 15, 1888. In 1858 he married the Princess-Royal of Britain, eldest daughter of Queen Victoria. He commanded the Army of the Oder in the war with Austria (1866), and in the Franco-German war he led the army which ultimately forced Napoleon III and his army to surrender at Sedan. He also took a prominent part in the siege of Paris. In 1887 he was attacked by a serious throat affection, which turned out to be of a cancerous character, and which after a series of relapses proved fatal. His renown as a military commander, his liberal views, his patience and fortitude under trouble, and his many lovable qualities made him popular.

Frederick VIII, King of Denmark, succeeded Christian IX in 1906. He was born in 1843, married the Princess Louisa of Sweden in 1869, and had three daughters and four sons, the oldest son, now Christian X, born in 1870. He was brother to the dowager Queen Alexandra of Britain, the dowager Empress Dagmar of Russia, and George I of Greece, and father of Haakon VII of Norway. Died in 1912.

Frederick Augustus II and III.

See *Augustus.*

Frederick Charles, Prince, known as the 'Red Prince,' born 1828; died 1885. He was nephew to the Emperor William I, and gained fame for his military exploits during the wars of 1866 and 1870. Sadowa, Thionville, Gravelotte, and St. Privat are among his chief achievements.

Fredericksburg, a city of Virginia, on the Rappahannock, 60 miles north by east of Richmond. Here the Federal forces under Burnside were defeated by the Confederates under Lee on the 13th of December, 1862. It has varied manufacturing industries, and the river affords considerable water-power. The city is under commission form of government. Pop. 5874.

Frederickstad, a town of Norway, at the mouth of the Glommen, 48 miles S. E. of Christiania. Formerly strongly fortified, it has an arsenal, manufactures hardware, pottery, etc., and has some shipping and general trade. Pop. 14,553.

Frederick William, of Prussia, generally called the *Great Elector*, was born in 1620; died in 1688. At the age of twenty he succeeded his father as Elector of Brandenburg. He must be considered as the founder of the Prussian greatness, and as the creator of a military spirit among his subjects. His reign began when the unhappy Thirty Years' war was still raging in Germany, and his conduct towards both parties was prudent. He succeeded in freeing Prussia from feudal subjection to Poland; and obtained possession of Pomerania in 1648. In 1672 he concluded a treaty with the Dutch Republic, when this state was threatened by Louis XIV. In 1673 he concluded a treaty by which France promised to evacuate Westphalia, and to pay 800,000 livres to the elector, who, in return, broke off his treaty with Holland, and promised not to render any aid to the enemies of France. In 1674 the German Empire declared war against France. The elector marched 16,000 men into Alsace, but a Swedish army having been induced to invade Prussia, Frederick turned back and totally defeated it at Fehrbellin (1675). Some years after the Swedes again invaded his territories, but were driven back. France, however, demanded the restoration of all the conquered territories to Sweden. The elector, having refused compliance, formed an alliance with Denmark, and waged a new war against Sweden, but was at last obliged to submit. He paid great attention to the promotion of agriculture and horticulture, and, by affording protection to the French refugees, gained 20,000 industrious manufacturers, who were of the greatest advantage to the north of Germany. Berlin was much improved during his reign. He left to his son a country much enlarged and improved, an army of 28,000 men, and a well-supplied treasury.

Frederick William I, King of Prussia, son of Frederick I and father of Frederick the Great (II), was born in 1688; died 1740. While crown prince (1706) he married Sophia Dorothea, daughter of the Elector of Hanover, afterwards George I of England. On his accession to the throne, in 1713, he endeavored to increase the army and reform the finances, and became the founder of the exact discipline and regularity which have since characterized the Prussian soldiers. He was very miserly, eccentric, and arbitrary. He opposed Charles XII, and was the protector of the neighboring Protestant states. His ridiculous fondness for tall men in his army is well known. He left behind him an abundant treasury, and an army of about 70,000 men. His affairs were in the greatest order and regularity, and to his energy Prussia was much indebted for that prosperity and success which distinguished her till she was humbled by Napoleon.

Frederick William II, King of Prussia, born 1744; died 1797. He succeeded his uncle, Frederick the Great, in 1786, and shared in the second partition of Poland.

Frederick William III, son of Frederick William II, born 1770; died 1840. During his reign Prussia suffered much at the hands of Napoleon, including defeats at Jena, Eylau, Friedland, etc., and lost a large portion of territory, which, however, was recovered after the fall of Napoleon.

Frederick William IV, King of Prussia, son of Frederick William III, was born 1795; died 1861. He was carefully trained by the best masters in all the leading branches of knowledge and art, civil and military. He took part, though without any active command, in the campaigns of 1813-14. When he succeeded to the throne by the death of his father in 1840 his first proceedings were both of a popular and praiseworthy character. He soon, however, began to pursue a retrograde and absolutist policy. The popular movement which followed the French revolution of 1848 was at first met by the king with firmness, but on the demand of the people that the troops should be withdrawn from the capital, backed by an attack on the arsenal, the king offered concessions, which, however, he retracted on his power becoming more secure. Subsequently his mind gave way, and he sank into a state of hopeless imbecility, which rendered it necessary to appoint his brother William regent of the kingdom. He died without issue, and was succeeded by his brother, who ten years later became emperor of united Germany.

Fredericton (fred'er-ik-tun), the capital of New Brunswick, Dominion of Canada, on the river St. John, about 84 miles from its mouth, and 54 miles N. N. W. of the town of St. John. It is well laid out, and has handsome public buildings, including the government house, the provincial buildings, courthouse, town-hall, cathedral, university, etc. The trade is extensive and increasing, the river being navigable for large steamers. Pop. (1911) 7208.

Frederikshald (frā'dreks-hal), or FREDERIKSHALL, a seaport of Norway, at the mouth of the Tistedal in the Idde-fiord, about 60 miles S. S. E. of Christiania. Immediately to the south stands the fortress of Fredriksteen, at the siege of which Charles XII of Sweden was killed, 30th November, 1718. An obelisk marks the spot. Pop. 11,948.

Fredonia, a village in Chautauqua County, New York, 3 miles S. of Dunkirk. It has large nurseries and canneries, and produces wine, grape juice and flour. Here is a State Normal School. Pop. 5285.

Free-bench, in law, the right which a widow has, in some parts of England, in her husband's copyhold lands, corresponding to dower in the case of freeholds.

Free Church of England, an Episcopal body separate from the Established Church of England, founded in 1844 as a counteracting movement to the tractarian movement. The churches belonging to it, though not numerous, are widely spread. The service is practically identical with that of the evangelical party of the national church. The church is governed by convocation and three bishops.

Free Church of Scotland, a Presbyterian Church organized as a separate body from the Established Church in May, 1843, as the final outcome of long continued dissensions in the church, dating back to the reign of Queen Anne. A proposal for union with the United Presbyterian Church failed in 1873; but a similar proposal with regard to the Reformed Presbyterian Church was successful in 1876.

Free Cities, cities having an independent government of their own, and virtually forming states by themselves; a name given to certain cities of Germany which were members

of the German Confederation, and exercised sovereign jurisdiction within their own boundaries. At the time of the French Revolution the free or 'imperial' cities numbered no fewer than fifty-one. These gradually lost their standing as free cities, and after the incorporation of Frankfort with Prussia in 1866 only three were left, Hamburg, Bremen, and Lübeck. These now rank as city-states of the German empire.

Free Companies, FREE LANCES, names given to the troops of private adventurers who, in the middle ages, organised themselves into bands of mercenary soldiers, and let out their services to the highest bidder. They played their most conspicuous part in Italy, where they were called *Condottieri*.

Free Congregations (Ger. *Freie Gemeinden*), sometimes called 'Protestant Friends,' a sect of German Rationalists, who at first professed to be Christians, but now reject the doctrines of miraculous revelation and a personal deity. There are upwards of 120 congregations of them in Germany, and a few in the United States.

Freedmen (*liberti, libertini*) was the name applied by the Romans to those persons who had been released from a state of servitude. The freedman wore a cap or hat as a sign of freedom (hence the origin of the cap of liberty), assumed the name of his master, and received from him a white garment and a ring. With his freedom he obtained the rights and privileges of a Roman citizen of the plebeian rank, but could not be raised to any office of honor. The title was applied to the freed slaves after the Civil war in the United States.

Freedmen's Bureau, established in the United States in 1865, exercised general supervision over the freedmen and other loyal refugees, protected their rights, found work for them, and provided education and medical treatment. It was abolished in 1870.

Freeland (frē'land), a borough of Luzerne County, Pennsylvania, 9 miles N. of Hazleton. It has machine shops and various factories, with coal-mines in its vicinity. Pop. 6197.

Freeman, EDWARD AUGUSTUS, an English historian and archæologist, born at Harborne, Staffordshire, in 1823, educated at Trinity College, Oxford, of which he was a scholar and fellow. He received various academical and other distinctions, and in 1884 became regius professor of modern history at Oxford. His works, which are very voluminous, include *History of Architecture*, 1849; *History and Conquests of the Saracens*, 1856; *Old English History*, 1869; *Growth of the English Constitution* 1872; *Historical Essays*, 1872-79; *History of the Norman Conquest*, 1867-76; and the *Reign of William Rufus and Accession of Henry I.*, 1882. He died in 1892.

Freeman, MARY WILKINS. See *Wilkins, Mary E.*

Freemasonry, a term applied to the organization of a society calling themselves *free* and accepted *masons*, and all the mysteries therewith connected. This society, if we can reckon as one a number of societies, many of which are unconnected with each other, though they have the same origin and a great similarity in their constitution, extends over almost all parts of the globe, and is consequently of the greatest service to travelers who are members of the craft. According to its own peculiar language, it is founded on the practice of social and moral virtue. It claims the character of charity in the most extended sense; and brotherly love, relief, and truth are inculcated in it. Fable and imagination have traced back the origin of freemasonry to the Roman Empire, to the Pharaohs, the Temple of Solomon, the Tower of Babel, and even to the building of Noah's ark. In reality, it took its rise in the middle ages along with other incorporated crafts. Skilled masons moved from place to place to assist in building the magnificent sacred structures—cathedrals, abbeys, etc.—which had their origin in these times, and it was essential for them to have some signs by which, on coming to a strange place, they could be recognised as real craftsmen and not impostors. Freemasonry in its modified and more modern form dates only from the seventeenth century. The modern ritual is said to have been partly borrowed from the Rosicrucians and knights templars, and partly devised by Elias Ashmole, the founder of the Ashmolean Museum. Freemasonry, thus modified, soon began to spread over the world. In 1725 it was introduced into France by Lord Derwentwater; and in 1733 the first American lodge was established. The United Grand Lodge of England recognises only two species of Freemasonry—the *Craft* and the *Royal Arch*: Scotch, Irish, American, and continental lodges acknowledge higher degrees; but these, with the exception of the *Mark Degree*, are not universal. In ordinary freemasonry there are three grades—those of apprentice, fellow-craft, and master ma-

son—each of which has its peculiar initiatory ceremonies; the last of these grades, however, is necessary to the attainment of the full rights and privileges of brotherhood. It is at present a very flourishing institution in the United States, and had in 1910 nearly 1,400,000 members, being surpassed in membership only by the Odd Fellows' Association. Freemasonry is under the ban of the church in Spain, Italy, and other Catholic countries, and its membership there is small and scattered.

Free Port, a harbor where ships of all nations may enter on payment of a moderate toll, and load or unload. Goods may be stored at first at free ports without paying any duty; the goods may then be either reshipped for export on paying a mere transit duty, or admitted on payment of the usual full customs of the country.

Freeport, a city, the county seat of Stephenson County, Illinois, 112 miles W. by N. of Chicago, on the Pecatonica River and four railroads, possesses railroad shops and manufactures of carriages, windmills, hardware, gasoline engines, etc. Pop. 21,000.

Free Soil, the name of a political party in the United States, founded in 1846 to oppose the extension of slavery to the Territories. It nominated Martin Van Buren for President in that year, but he failed to gain any electoral votes. It had a candidate also in 1852, but was absorbed by the Republican party in 1856.

Free Spirit, BRETHREN OF THE, a sect of heretics which originated in Alsace in the thirteenth century, and quickly became disseminated over Italy, France, and Germany. They claimed 'freedom of spirit,' and based their claims on Rom., viii. 2-14. 'The law of the spirit hath made me free from the law of sin and death.' Thence they deduced that they could not sin, and lived in open lewdness, going from place to place accompanied by women under the name of 'sisters.'

Freestone. See *Sandstone.*

Freethinkers, an epithet applied to the English Deists of the seventeenth and eighteenth centuries who argued for natural as against revealed religion. Anthony Collins (who first made it a name of a party by his *Discourse of Free-thinking*, London, 1713), and his friend, John Toland, are among the chief of the early freethinkers. Another able writer on the same side was Math. Tindal (died 1733), whose *Christianity as Old as the Creation* (1730) caused a great sensation. Bolingbroke and Hume take the lead among advanced freethinkers. In France Voltaire and the encyclopedists D'Alembert, Diderot, and Helvetius led the opposition against revealed religion. The same spirit became fashionable in Germany in the reign of Frederick the Great. The term is now generally applied to designate Rationalists in general, who are to be found among Christians as well as non-Christians.

Freetown, a seaport of West Africa, capital of the British settlement of Sierra Leone, not far from the entrance of the estuary or river of Sierra Leone, in the vicinity of extensive swamps, which make it very unhealthy. Its principal streets are broad and straight, and have a very attractive appearance. Among the public buildings are several churches, a governor's house, and barracks. Pop., 30,000, largely liberated negroes. Only a few hundred of these are Europeans.

Free-trade, the term applied to national commerce when relieved from such interference as is intended to improve or otherwise influence it; that is, unrestricted by laws or tariffs, and not unduly stimulated by bounties. In all countries it was long held to be of importance to encourage native production and manufactures by excluding from their own markets, and from the colonial markets over which they had control, the competing produce and manufactures of other countries. On this theory the great body of British commercial legislation was founded until 1846, when the policy of free-trade was introduced in grain, and afterwards gradually extended by the repeal of the navigation laws in 1849 and other great measures, until nearly all British commercial legislation has been brought into conformity with it. Free-trade can hardly yet be said to have been adopted as a principle of commercial policy by any nation except Great Britain. As an economic principle free-trade is the direct opposite to the principle or system of *protection*, which maintains that a state can reach a high degree of material prosperity only by protecting its domestic industries from the competition of all similar foreign industries. To effect this protecting countries either prohibit the importation of foreign goods by direct legislation, or impose such duties as shall, by enhancing the price, check the introduction of foreign goods. The advocates of what is called *fair trade*, a recent development in Britain, profess a preference for free-trade were it universal or

even common, but in view of the fact that Britain is almost the sole free-trade country in the world, they declare that a policy of reciprocity is required for the protection of British traders and manufacturers. The progress made by Britain since 1846 is adduced by free-trade advocates as a striking proof of the wisdom of the existing policy. See *Protection*.

Free-will, the power of directing our own actions without constraint by necessity or fate, a doctrine maintained in the fields both of theology and of metaphysics. See *Will*.

Freezing (frēz'ing), CONGELATION, or SOLIDIFICATION, the transformation of a liquid into a solid under the influence of cold. Each liquid always solidifies at some fixed temperature, which is called its freezing-point, and the solid melts again at the same temperature. Thus the freezing-point and the melting-point, or point of fusion, are the same, and the point is always the same for the same substance. Consequently the freezing-point of water, or the melting-point of ice (32° Fahr.), is taken for one of the fixed points in thermometry. The freezing-point of mercury is 39° below zero, of sulphuric ether 46° below zero, of alcohol 203° below zero Fahr. It has been shown that the increase of pressure upon water, and upon all substances which expand in freezing, will lower the freezing-point; and that such substances as wax, spermaceti, sulphur, and paraffin, which contract in freezing, have the freezing-point raised by pressure. Artificial freezing is attained by the liquefaction of solids or the evaporation of liquids. These processes absorb heat, and by abstracting it from the surrounding substances freeze the latter. Among freezing mixtures are: (1) two parts of pounded ice or fresh snow and one part of common salt, which causes the thermometer to fall to —4°; (2) equal parts of water, of powdered crystallized nitrate of ammonia, and of powdered crystallized carbonate of soda, which produces a cold of —7°; (3) three parts of snow with four parts of crystallized chloride of calcium, producing a temperature of —54°; while (4) with a mixture of liquid nitrous oxide and carbon disulphide a temperature of —220° is reached. Ice-making machines are now in common use in the United States, large quantities of artificial ice being made at prices enabling it to compete with natural ice.

Freiberg (frī'berh), a German mining town, the center of the mining district of Saxony, 20 miles W. S. W. of Dresden, near the Mulde. There are still remains of its former walls, towers, and ditches, but their site has mostly been converted into a promenade. The principal buildings and establishments are the cathedral, the mining academy with a museum attached, the townhouse, the castle (now a military magazine), the royal silver refinery, etc. The Freiberg district yields silver, copper, lead, and cobalt, and the city has large silver-smelting works, besides numerous manufactories. Pop. 30,896.

Freiburg (frī'burh), or FREIBURG IM BREISGAU, a town of Baden, on the Dreisam, 42 miles S. S. E. of Strasburg. It consists of the town proper, still possessing some remains of fortifications, and of two suburbs. The chief buildings are the cathedral, a large and beautiful Gothic structure, with a fine portal richly sculptured, and surmounted by a tower with a spire of exquisite open work 380 feet high; the Ludwigskirche; the university, founded in 1456; the museum, theater, grand-ducal palace, etc. The manufactures are numerous, but not individually of great extent. Pop. (1910) 83,324.

Freiburg, a canton and town of Switzerland. See *Fribourg*.

Freienwalde (frī'en-vāl-de), a town of Prussia, district of Potsdam, with a chalybeate spring and bathing establishment in the vicinity. Pop. 7995.

Freight (frāt), the sum paid by a merchant or other person hiring a ship or part of a ship, for the use of such ship or part during a specified voyage, or for a specified time; also any sum charged for the transportation of goods, and the goods themselves, however transported.

Freiligrath (frī-lih-rāt), FERDINAND, German lyric poet, born at Detmold, 1810; died at Cannstadt, in Würtemberg, 1876. In 1838 he published at Mainz a volume of his collected poems, which proved successful and gained him a pension, which he relinquished on the publication of his *Glaubensbekenntnis* ('Confession of Faith'), the republican character of which caused his prosecution and flight to London. He returned to Germany in 1848 and took part in the revolutionary movements, publishing the political poems *Die Revolution*, *Februarklänge*, and *Die Todten an die Lebenden*. The last of these led to his being put on trial for treason. This trial, in which he was acquitted, is memorable for another reason, being the first jury trial ever held in Prussia. From 1851 till 1867 Freiligrath again resided in England, but his last years were spent

at Cannstadt. Many of his songs are yet popular. Germany is indebted to him for many admirable translations from foreign languages, as from Burns, Tannahill, Moore, Hemans, Shakespere, Longfellow, Walt Whitman, and Victor Hugo.

Freising (frī'zing), a town of Bavaria, on the left bank of the Isar, 21 miles N. N. E. of Munich. It has a fine old cathedral church. Pop. (1905) 13,538.

Fréjus (frā-zhüs; ancient *Forum Julii*), a town, France, dep. Var, on the Mediterranean, 45 miles N. E. of Toulon. Pop. (1906) 3430.

Frelinghuysen (frē-ling-hī'sen), the name of several Americans of note.—(1) FREDERICK, born in New Jersey in 1753, died in 1804. He was a member of the Continental Congress during most of the Revolutionary war, served as a captain in the army, took part in 1796 in the expedition against the Whisky Insurrection, and was United States senator, 1793-96. (2) THEODORE, a son of the former, was born in Millstone, New Jersey, in 1787, died in 1862. He commanded a company of volunteers in the war of 1812, and was elected to the United States Senate in 1829. He was made Chancellor of the University of New York in 1838, and in 1844 was nominated for Vice-President of the United States by the Whig party. He was defeated, with Henry Clay, the candidate for President. In 1850 he became president of Rutgers College. (3) FREDERICK THEODORE, a nephew of the last named, was born at Millstone, New Jersey, in 1817, died in 1885. He gained eminence as a lawyer, was attorney-general of New Jersey 1861-66, United States Senator 1868-77, and Secretary of State in President Arthur's cabinet 1881-85.

Fremont (frē-mont), a city, county seat of Dodge County, Nebraska, 32 miles W. N. W. of Omaha. It has a large trade in grain and lumber, and has dairying and agricultural interests and various manufactures. Pop. 10,000.

Fremont, a city, county seat of Sandusky County, Ohio, 30 miles S. E. of Toledo, on the river Sandusky. Lines of steamers run to the principal ports of Lake Erie. It is in a productive oil and natural gas region and has numerous industries. A hydro-electric power plant was completed in 1913 at a cost of $1,500,000. Pop. 12,000.

Frémont, JOHN CHARLES, explorer, born at Savannah, Georgia, in 1813. He conducted five separate and adventurous expeditions which explored the passes of the Rocky Mountains. In the year 1845 he crossed the mountains by a new line, scaling the summits south of the South Pass and crossed 3500 miles of country, much of it in sight of eternal snows, discovering the grand features of Alta California, its great basin, the Sierra Nevada and the valleys of San Joaquin and Sacramento. He was again in California during the Mexican war and did much in securing that country for the United States. In 1848 he purchased a large auriferous tract called the Mariposa estate, on which he settled in 1849. He conducted a final expedition to the Pacific in 1853, and in 1856 he was the first candidate of the newly-organized Republican party for the Presidency, but was defeated by the Democratic candidate. In 1861, on the outbreak of the Civil war, he was appointed a major-general of volunteers. He then, as commander of the western Union army, marched into Missouri with the view of encountering General Price's Confederate force then in possession of that state, but an order issued by him for the confiscation of the property and emancipation of the slaves of those in arms against the government was disapproved by the President and he was removed from the command and sent to the East, where he fought an indecisive battle at Cross Keys. Soon after he resigned his command, being unwilling, for personal reasons, to serve under General Pope. He was appointed Governor of Arizona in 1878, and commissioned major-general in the regular army, retired, in 1890. He died in the same year.

French, SIR JOHN DENTON PINKSTONE, a British soldier, born at Ripple Vale, Kent, in 1852. He entered the army in 1874; served in the Sudan campaign and in the Boer war, where he gained the reputation of a daring cavalry leader. At the outbreak of the European war he was appointed commander-in-chief of the British land forces operating in France.

French Berries, known also as *Avignon berries* and *yellow berries*, the drupe of the *Rhamnus alaternus*, one of the species of buckthorn. In size they are rather less than a pea, have a bitter and astringent taste and are used by dyers as a yellow coloring matter. The berries are imported from France and also from Persia, whence they are sometimes called Persian berries.

French Chalk, scaly talc, a variety of indurated talc, in masses composed of small scales of a

pearly-white color; used by tailors for marking cloth and removing grease.

French Guinea, a colony of France, lies on the W. coast of Africa between Portuguese Guinea and the British colony of Sierra Leone, and extends inland to about 7½° W. The highland region of Futa Jallon, which begins about 80 m. from the coast, is rich in gold and cattle. The chief products of the colony are palm-oil and nuts, millet, earthnuts, gum, rubber, and coffee. The principal exports are rubber, cattle, ground-nuts, and palm-kernels. A railroad (366 m. long) from Konakry, the capital, to the Niger was opened in 1911. Area, 95,000 sq. m.; pop. 1,500,000.

French Language and Literature. See *France, Language of,* and *Literature of.*

French Revolution, a political revolution for which the intellectual movement of the 18th century, connected with the names of Montesquieu, Diderot, Voltaire and Rousseau, had prepared the way. The direct causes, however, were political and economic rather than intellectual. See *France, History.*

Freneau (fre-nō), PHILIP, poet, was born in New York city in 1752. Graduated at Princeton in 1771. Captured by a British cruiser in 1780, he wrote *The British Prison Ship.* As editor of the *National Gazette* his virulent attacks on the Federalists aroused Hamilton's anger. His poems were numerous, chiefly of Revolutionary times. He died in 1832.

Frere (frēr), SIR HENRY BARTLE EDWARD, statesman and administrator, born at Clydale, Wales, 1815; died at Wimbledon, 1884. He entered the East India Company's civil service in 1833; mastered the native languages with great rapidity, and introduced important improvements into the system of tax collection. He rendered valuable services during the mutiny, at the close of which he was nominated to the viceroy's council at Calcutta. In 1872 he negotiated a treaty with the Sultan of Zanzibar, abolishing the slave trade in that ruler's dominions. In 1877 he went to South Africa as commissioner for the settlement of native affairs, but this mission was a failure. He was the author of a life of his uncle, John Hookham Frere, numerous lectures, pamphlets, etc.

Frere, JOHN HOOKHAM, born at London in 1769; died at Malta in 1846. He is now chiefly remembered as one of the writers in the *Anti-Jacobin Review* at the close of the eighteenth century; and afterwards connected with the establishment of the *Quarterly Review* in 1809. A satirical poem published by him in 1817, entitled *Prospectus and Specimen of an Intended National Work, by William and Robert Whistlecraft,* followed by another entitled *The Monks and the Giants,* obtained in their day much popularity. His translations in verse of some of the comedies of Aristophanes are well known for their remarkable excellence. Mr. Frere entered parliament in 1796, and succeeded Canning as under-secretary for foreign affairs in 1799. In 1818-19 he acted as British ambassador in Spain, and subsequently held other diplomatic posts in Portugal and Prussia. The latter years of his life were spent in Malta.

Fréron (frā-rōn), ELIE CATHARINE, a French journalist, born at Quimper in 1719; died at Paris 1776. In 1746 he commenced a periodical entitled *Lettres de Madame la Comtesse de ———*; this, with various interruptions and change of name, was continued until his death. He may be called the founder of newspaper criticism in France; and had a lifelong conflict with Voltaire and the encyclopedists.

Fresco Painting (fres-kō), a method of mural painting in water colors on fresh or wet grounds of lime or gypsum. Mineral or earthy pigments are employed, which resist the chemical action of lime. In drying, the colors are incorporated with the plaster, and are thereby rendered as permanent as itself. In producing fresco paintings, a finished drawing on paper, called a cartoon, exactly the size of the intended picture, is first made, to serve as a model. The artist then has a limited portion of the wall covered over with a fine sort of plaster, and upon this he traces from his cartoon the part of the design suited for the space. As it is necessary to the success and permanency of his work that the colors should be applied while the plaster is yet damp, no more of the surface is plastered at one time than what the artist can finish in one day. A portion of the picture once commenced, needs to be completely finished before leaving it, as fresco does not admit of retouching after the plaster has become dry. On completing a day's work, any unpainted part of the plaster is removed, cutting it neatly along the outline of a figure or other definite form, so that the joining of the plaster for the next day's work may be concealed. The art is very ancient, remains of it being found in India, Egypt, Mexico, etc. Examples of Roman frescoes are found in Pompeii and

other places. After the beginning of the fifteenth century fresco painting became the favorite process of the greatest Italian masters, and many of their noblest pictorial efforts are frescoes on the walls of palaces and churches. Some ancient wall-paintings are executed in what is called *Fresco Secco*, which is distinguished from true fresco by being executed on dry plaster, which is moistened with lime water before the colors are applied. Fresco painting has in recent years again been revived, and works of this kind have been executed in the British Houses of Parliament and other public and private buildings, more especially in Germany.

Fresnel (frā-nel), AUGUSTIN JEAN, a celebrated French physicist, born 1788; died 1827. He began to experiment upon the nature of light about 1815, received a prize in 1819 from the Academy of Sciences for his treatise *On the Diffraction of Light*, and in the end did for physical optics what Newton had done for astronomy, his experiments tending to prove the truth of the theory that light consists in the vibration of an elastic medium. Up to that date the emission theory of Newton had held sway. The honor for this great result he shares in common with the English physicist, Dr. Thomas Young. He made the first successful use of lenses in the lamps of lighthouses, inventing the illuminating apparatus, which is now used throughout the civilized world.

Fresnillo (fres-nēl'yo), a city of Mexico, in state of and 30 miles N. N. W. of Zacatecas. In this vicinity are celebrated silver and copper mines. Pop. 13,000.

Fresno (frez'nō), a city, seat of Fresno County, California, 208 miles S. E. of San Francisco. It is in a productive grain and fruit region and is especially noted for the raisin product of its vicinity and for its wine. It ships fruits, green and dried, cereals and wool. Pop. 30,000.

Fret, a kind of ornament much employed in Grecian art and in sundry modifications common in various other styles. It is formed of bands or fillets variously combined, but most frequently consists of continuous lines arranged in rectangular forms. Sometimes called *key ornament*.

Frets, certain short wood, ivory, or metal crossbars on the fingerboards of stringed instruments, as the guitar, etc., which regulate the pitch of the notes. By pressing the string down to the fingerboard behind a fret only so much of the string can be set in vibration as lies between the fret and the bridge.

Freudenstadt (froi'den-stät), a town of Würtemberg, 40 miles S. W. Stuttgart, with a fine old church and a town-house. Pop. 7[illegible].

Freya (frī'ya), in the northern mythology, the goddess of love and wife of Odhr; she was a friend of sweet song, and loved to hear the prayers of mortals. She had a famous necklace, much celebrated in Scandinavian legends. She is often confounded with Frigga.

Freyberg. See *Freiberg*.

Freyburg. See *Freiburg*.

Freycinet (frā-si-nā), CHARLES LOUIS DE SAULCES DE, a French statesman, born at Foix (Ariège), in 1828. He was trained as an engineer, and held several important appointments; he was elected to the senate in 1876; was minister of public works, 1877; minister for foreign affairs, 1879, and president of the council and minister for foreign affairs for longer or shorter periods in 1882 and 1886. He is the author of several important works on engineering.

Freytag (frī'tȧh), GUSTAV, a German poet, dramatist, and novelist, born 1816. He was editor of the *Leipzig Grenzboten* from 1848 to 1870, and has produced numerous successful plays, tales, and poems. Among his more famous works are *Soll und Haben* ('Debit and Credit'); *Bilder aus der Deutschen Vergangenheit* ('Pictures from the German Past'); *Die Verlorene Handschrift* ('The Lost Manuscript'), and *Die Ahnen* ('Our Ancestors'), a series of six romances illustrative of old German life. Died 1895.

Friar (frī'ar; Fr. *frère*, Lat. *frater*, brother), in the Roman Catholic Church an appellation common to the members of all religious orders, but more especially to those of the four mendicant orders, viz. (1) Minors, Gray Friars, or Franciscans; (2) Augustines; (3) Dominicans or Black Friars; (4) White Friars or Carmelites.

Fribourg, or FREIBURG (frē-bör', frī'bȕrk), a canton of Switzerland, surrounded by the cantons of Berne and Vaud, except a narrow part, which touches the Lake of Neufchâtel. The southern part is mountainous, the northern part more level. The whole canton abounds in excellent pasturage, and cattle breeding and dairy husbandry are the chief occupations of the inhabitants. Area, 644 square miles; pop. 127,951, of whom the great majority are Roman Catholics speaking French. The capital, which has the same name, is picturesquely situated on the Saane, 17

miles S. W. Berne. It stands partly on a rocky eminence at the edge of a ravine nearly surrounded by the river, which is here spanned by a suspension bridge 168 feet above the water. The Gothic church of S. Nicholas contains one of the finest organs in Europe. Pop. 15,794.

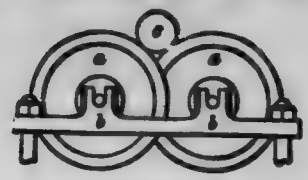
Fricassee (fri-kas-sē), a dish of food made by cutting chickens, rabbits, or other small animals into pieces, and dressing them with a strong sauce in a frying pan or a like utensil.

Fricative (frik'a-tiv), a term applied to certain letters produced by the friction of the breath issuing through a narrow opening of the organs of articulation, as *f*, *v*, *s*, *z*, etc.

Friction (frik'shun), in physics, the effect of rubbing, or the resistance which a moving body meets with from the surface on which it moves. Friction arises from the roughness of the surface of the body moved on and that of the moving body. No such thing can be found as perfect smoothness of surface in bodies. In every case there is, to a less or greater extent, a roughness or unevenness of the parts of the surface, arising from peculiar texture, porosity, and other causes, and therefore when two surfaces come together the prominent parts of the one fall into the cavities of the other. This tends to prevent or retard motion, for in dragging the one body over the other an exertion must be used to lift the prominences over the parts which oppose them. What is called the *coefficient of friction* for any two surfaces is the ratio that subsists between the force necessary to move one of these surfaces horizontally over the other and the pressure between the two surfaces. Thus, the coefficient of friction for oak and cast-iron is 38 : 100, or .38. Friction plays a most important part in nature and art; for instance, but for it threads could not be made nor textile fabrics manufactured.

Friction-rollers, a name common to any small rollers or cylinders employed to convert sliding motion into rolling motion. Such cylinders are often placed under heavy bodies when they are required to be moved any short distance on the surface of the ground; and, in machinery, the same method is occasionally employed to diminish the friction of a heavily loaded axis. In that case a number of small cylinders are inclosed round the axis, and partake of its motion.

Friction-wheels, in machinery, two simple wheels or cylinders intended to assist in diminishing the friction of a horizontal axis. The wheels are simply plain cylinders (*a*, *a*) carried on parallel and independent axes (*b*, *b*). They are disposed so as to overlap pair and pair at each end of the main axis (*c*), which rests in the angles thus formed by the circumferences.



Friction-wheels.

The axis, instead of sliding on a fixed surface, as in ordinary cases, carries round the circumferences of the wheels on which it is supported with the same velocity as it possesses itself, and in consequence the friction of the system is proportionally lessened.

Friday (frī'dā), the sixth day of the week, from the Anglo-Saxon. *Frige-dæg*, the day sacred to *Frigga* or to *Freya*, the Saxon Venus. See *Good Friday*.

Friedland (frēd'lânt). (1) A town of Northern Bohemia. Wallenstein was created Duke of Friedland in 1622. Pop. 6241. (2) A small town of East Prussia, 28 miles S. E. of Königsberg, on the river Alle. Pop. 2824. The Russians under Benningsen were here defeated on the 14th June, 1807, by the French under Napoleon. (3) A town of Mecklenburg-Strelitz, 30 miles N. E. of Strelitz. Pop. 7143.

Friedrich (frēd'rih). the German form of *Frederick*.

Friedrichsthal (frēd'rihs-tāl), a town in the extreme south of Rhenish Prussia, with glassworks and coal and iron mines. Pop. 5871.

Friendly Islands, or TONGA ISLANDS, a cluster in the South Pacific Ocean, between lat. 18° and 23° S., and lon. 173° and 176° W. They consist of three groups, which are divided from each other by two narrow channels, and number altogether about 150, with a collective area of about 400 sq. miles. The largest island is Tongatabu, in the S. group, with an area of 128 sq. miles, and containing the capital, Nukualofa. Vavao, in the N. group, which is named after it, is next to Tongatabu in size; the central group is called Hapai. The islands are nearly all volcanic, with coral reefs and rocks about them; earthquakes and volcanic eruptions are frequent; during one of which, in Oct., 1885, a new island 2 miles in circumference suddenly appeared.

These islands were discovered in 1643 by Tasman, but received their collective name from Cook. They are now governed by a native Christian prince. The trade is considerable, the chief exports being copra, coffee, and wool. Population, 20,677, including about 260 foreigners.

Friendly Societies, societies formed for the mutual advantage of the members, and based on the principle that it is by the contribution of the savings of many persons to one common fund that the most effectual provision can be made for casualties affecting, or liable to affect, all the contributors.

Mutual provident association, on the voluntary principle and in a friendly society form, as an economic duty, is strictly confined at present to the English-speaking races, though attempts are being made to introduce the system in both Italy and Austria-Hungary. Provident insurance, indeed, is enforced throughout the German empire among all classes of workmen, but only as a form of state socialism enacted by law and largely subsidized by the employers. In France the method employed is the individualistic system of savings banks. See *Fraternal Societies.*

Friends. See *Quakers.*

Fries (frēs), Elias Magnus, a Swedish botanist, born 1794; died 1878. He published, among other volumes, a great work on fungi.

Fries (frēs), Jakob Friedrich, a German philosopher, born 1773; died 1843. His works are numerous, the most important being *Neue Kritik der Vernunft, System der Philosophie als evidente Wissenschaft,* and *Wissen, Glaube und Ahnung.*

Fries, John, a German-American, leader of Fries Rebellion, born in Bucks county, Pa., in 1764; died in 1825. He took a keen interest in local politics, and when, in 1798, Congress voted a direct tax of $2,000,000, and Pennsylvania's quota was fixed at $237,000, to be levied on houses and lands, he and other Germans of the counties of Montgomery, Lehigh, Bucks, and Berks offered a strenuous opposition. When the federal officers came to collect the tax, Fries put himself at the head of the opposition and formed armed companies. These seized and punished such officers as attempted to carry out the law. At a meeting, held in February, 1798, at Lower Milford, he promised to raise 700 men, and soon after, at the head of a company, he arrested the government assessors and liberated several prisoners. The next day, at Bethlehem, he forced the United States marshal to liberate his prisoners by threatening to resort to firearms. The militia was consequently called out, and Fries and others were taken prisoners. He was twice tried for high treason for this offense, and sentenced each time to death, but in April, 1800, was pardoned by President Adams.

Friesland (frēz'land), the most northerly province of Holland. The area is 1281 sq. miles. Leeuwarden is the capital. Pop. 342,286. See *Frisians.*

Frietchie, Barbara, was born at Lancaster, Pa., in 1766; died in 1862. In 1806 she married John Caspar Frietchie, of Frederick, Md. Whittier's celebrated poem *Barbara Frietchie* (1863), founded upon the story, is now regarded as of doubtful authenticity, or, at least, on a confusion between Mrs. Frietchie and a Mrs. Quantrell. Mrs. Frietchie, however, did greet the Union troops by waving a flag from the porch of her house.

Frieze (frēz), a kind of coarse woolen stuff or cloth, with a nap on one side.

Frieze (frēz), in architecture, that part of the entablature of columns which lies between the architrave and cornice. It is a flat member or face, usually enriched with figures or other ornaments of sculpture. See *Entablature.*

Frigate (frig'at), originally a Mediterranean vessel propelled by sails and oars; afterwards a ship of war, larger than a sloop or brig and less than a ship of the line, usually carrying her guns (which varied from about thirty to fifty or sixty in number) on the main deck and on a raised quarter-deck and forecastle, or having two decks. Such ships were often fast sailers, and were much employed as cruisers in the great wars of the eighteenth and early part of the nineteenth centuries. The name is no longer in use for naval vessels.

Frigate-bird, or Man-of-war Bird (*Tachypētes aquilus*), an American tropical web-footed bird of the family Pelecanidæ, found on the Atlantic and Pacific coasts. Including the long tail, the male bird reaches 3 feet in length, but the body is comparatively small. The bill is longer than the head, strong, hooked at the point, and sharp. In proportion to their size their wings are longer than in any other bird, having an extent of 7 feet or more. Their flight is powerful and graceful; they neither swim nor wade, but catch the flying fishes in the air, and cause fishing birds to disgorge their prey, which they dex-

terously seize as it falls. Their general color is black, but the under feathers of the females are white.

Frigga, or Fricg, in northern mythology, the wife of the god Odin, the goddess after whom Friday is named. She is a goddess in some respects corresponding with Venus, and is often confounded with Freya.

Frilled Lizard, an Australian lizard, *Chlamydosaurus Kingii*, so called from a curious membrane-like ruff or tippet round its neck, covering its shoulders, and which lies back in plaits when the animal is tranquil, but which elevates itself when it is irritated or frightened. A full-grown specimen is about three feet in length.

Frigate-bird (*Tachypetes aquilus*).

Frimaire (frē-mār; Fr., from *frimas*, hoar-frost), the third month of the French republican calendar, dating from September 22, 1792. It commenced November 21, and ended December 20.

Fringe-tree (*Chionanthus Virginica*), a small tree belonging to the same natural family with the olive, and having snow-white flowers which hang down like a fringe, inhabiting America from lat. 39° to the Gulf of Mexico. It is frequently cultivated in gardens as an ornamental plant. Four other species of *Chionanthus* are known, two of which inhabit the West Indies, the third Ceylon, and the fourth Australia.

Fringillidæ (frin-jil'i-dē), a large family of conirostral birds, comprising the finches (which see).

Frisians (fris'i-anz), a German tribe who, about the beginning of the Christian era, occupied the territory between the mouths of the Rhine and the Ems. They became tributaries of Rome under Drusus, and lived for some time on friendly terms with their conquerors, but were driven to hostilities by oppression. In time they extended as far eastward as Slesvig, and even made settlements on the Firth of Forth, and probably in other parts of Northern Britain. About the end of the seventh century the Frisians in the southwest were subdued by the Franks under Pépin d'Héristal, who compelled them to accept Christianity. A century later the eastern branch of the tribe was conquered and Christianized by Charlemagne. Their country was divided into three districts, two of which were annexed on the division of the Carlovingian empire to the possessions of Louis the German, and the other to those of Charles the Bald. The latter part was called West Frisia. (W. Friesland), and the two former East Frisia (E. Friesland). Their modern history is chiefly connected with Holland and Hanover. The *Frisian Language* holds in some respects an intermediate position between Anglo-Saxon and Old Norse. Of all the Teutonic dialects it is the most nearly related to English. Its ancient form exists only in some remarkable collections of laws. Three dialects of it are now recognized: the West Frisian, spoken in the Dutch province of Friesland, about Leeuwarden, Bolsward, etc., and used to some extent in literature; the East Frisian, spoken between the mouths of the Ems and Weser; and the North Frisian, spoken on the west coast of Schleswig and South Jutland, and on the islands Sylt, Föhr, Amrun, etc.

Frit, the matter of which glass is made after it has been calcined. (See *Glass.*) The term is also applied to semivitrified earthenware, often pounded and used for glaze.

Frit, the *Chlorops* or *Oscinis frit*, a small greenish-black fly, the larvæ of which do great damage to barley crops in some parts of the north of Europe. It is nearly allied to the corn or wheat fly known in Britain.

Frith. See *Firth*.

Frith, William Powell, born at Studley, near Ripon, 1819. After 1840, when he exhibited *Malvolio before Olivia*, at the Royal Academy, he produced a great number of scenes from Shakespere, Molière, Dickens, Sterne, Goldsmith, etc., besides his immensely popular pictures, *Coming of Age in the Olden Time* (1849), *Life at the Seaside* (1854), *The Derby Day* (1858), *The Railway Station* (1862), *Before Dinner at Boswell's Lodgings* (1868), *The Private View at the Royal Academy* (1881), etc. He was commissioned by the queen

to paint the marriage of the Prince of Wales. He was elected R. A. in 1852, and was a member of several foreign academies. He died in 1909.

Frith Gilds, among the Anglo-Saxons, voluntary associations of neighbors for purposes of order and self-defense. They repressed theft, traced stolen cattle, and indemnified parties robbed from a common fund raised by subscription of the members.

Frithjof (frēt'yof), an Icelandic hero, supposed to have lived in the eighth century. After a series of adventures, recorded in an ancient Icelandic saga of the thirteenth century, he marries Ingebjörg, the widow of the king Hring. The story forms the groundwork of Tegner's popular poem, *Frithjof's Saga*, and has been frequently translated.

Fritillary (frit'i-la-ri; *Fritillaria*), a genus of plants, nat. order Liliaceæ, natives of north temperate regions. *F. Meleagris*, or common fritillary, is found in meadows and pastures in the eastern and southern parts of England. Several species, as *F. imperialis* or crown-imperial, are cultivated in gardens, chiefly introduced from Persia and the warmer parts of Europe.

Fritillary, the popular name of several species of British butterflies. The *Argynnis paphia* is the silver-washed fritillary; the *A. aglaia* is the dark-green fritillary; the rare and much-prized *A. lattonia* is the queen-of-Spain fritillary.

Friuli (fri-ō'lē), a formerly independent duchy at the head of the Adriatic, now forming part of Italy and Austria. It was one of the most important duchies of the Longobard Kingdom, and up to the fifteenth century, when it was conquered by Venice and its territories dismembered, it retained a considerable degree of independence. The inhabitants, called Furlani, are Italian for the most part, but speak a peculiar dialect.

Frobisher (frob'ish-er), Sir Martin, one of the great Elizabethan navigators, born near Doncaster, England, about 1535; died at Plymouth, 1594. He made three expeditions to the Arctic regions for the purpose of discovering a northwest passage to India, and endeavored to found a settlement north of Hudson Bay, hopes of immense wealth to be found in these northern regions having taken the public fancy. In 1585 he accompanied Sir Francis Drake to the West Indies. At the defeat of the Spanish armada in 1588 he commanded one of the largest ships in the fleet, and was honored with knighthood for his services. In the years 1590 and 1592 he commanded squadrons against the Spaniards and took many rich prizes. In 1594 he was sent to the assistance of Henry IV of France, when, in an attack on a fort near Brest, he was mortally wounded.

Froebel (frœ'bel), Friedrich Wilhelm August, a German educationist, born in 1782; died in 1852. After an unsettled and aimless youth, and with somewhat imperfect culture, he started teaching, and soon developed a system which has become famous under the name of *Kindergarten* (which see). He is the author of *Die Menschenerziehung* ('Human Education'), and *Mutter- und Koselieder*, a book of poetry and pictures for children. A Froebel Society, for the promotion of the kindergarten system, was established in 1874.

Frog, the common English name of a number of animals belonging to the class Amphibia, having four legs with four toes on the forefeet and five on the hind, more or less webbed, a naked body, no ribs, and no tail. Owing to the last peculiarity frogs belong to the order of amphibians known as Anura or tailless Amphibia. The tongue is fleshy, and is attached in front to the jaw, but is free behind, so that the hinder extremities of the tongue can be protruded. Frogs are remarkable for the transformations they undergo before arriving at maturity. In the spring the spawn is deposited in ponds and other stagnant waters in large masses of gelatinous matter. These masses, with black globules scattered through them, soon manifest change, and after a time the young escapes as a tadpole, an animal with short body, circular suctorial mouth, and long tail, compressed from side to side. Gills project on either side of the head from a cleft which answers in position to the gill opening of fishes. The hindlimbs first appear as buds, later the forelimbs project, the gills disappear, the lungs becoming more fully developed; the tail gradually shrinks and falls off, and the animal, which was at first fish-like, then closely resembled a newt (or tailed Amphibian), finally assumes the adult or tailless form. The mature frog breathes by lungs, and cannot exist in water without coming to the surface for air. The only British species is the common frog (*Rana temporaria*), but the tribe is very numerous, other varieties being the edible frog (*R. esculenta*) of the south of Europe, eaten in France and South Germany, the hind quarters being the part chiefly used; the bull-frog

of America (*R. pipiens*), 8 to 12 inches long, so named from its voice resembling the lowing of a bull; the blacksmith frog of Janeiro, the Argus frog of America, etc. Of the tree-frogs most belong to the genus *Hyla*. (See *Tree-frog*.) Frogs swim with rapidity, and move by long bounds, being able from the power of the muscles of their hind legs to leap many times their own length.

The skeleton of the adult frog presents some remarkable points, first in peculiarity being the shape of the head and the enormous size of the orbits of the eyes, which are so large that when the skull is placed flat upon an open book several words can be read through the orifices. Very little room is left for the brain, and in consequence the intellectual powers of the frog are but slender. The vertebræ are furnished with projections at each side, but the ribs are totally wanting. Because of this deficiency the respiratory movements are made not by the sides but by the throat.

Frogfish. See *Angler-fish*, and also *Choironectes*.

Frogspit. Same as *Cuckoo-spit*.

Frohsdorf. See *Froschdorf*.

Froissart (frwä-sär'), JEAN, a French poet and historian, was born in 1337 at Valenciennes; died in Flanders between 1400 and 1410. He received a liberal education, and took orders in the church, but his inclination was more for poetry and gallantry. At the age of eighteen he went to England, where, having already the reputation of being a gay poet and narrator of chivalric deeds, he was received with great favor, Philippa of Hainault, wife of Edward III, declaring herself his patroness. After returning to the continent and traveling for some time, he again visited England, and in 1361-66 he was secretary to the queen. He also visited Scotland, and was entertained by King David Bruce and William, Earl of Douglas. In 1366 he left England and again traveled. After the death of Queen Philippa, Froissart became curé of Lestines in Hainault, and was patronized by Wenceslaus, Duke of Brabant, who was himself a poet, and of whose verses, united with some of his own, Froissart formed a sort of romance called *Meliador*. On the death of Wenceslaus he entered the service of Guy, Count of Blois, who gave him the canonry of Chimay, and induced him to take in hand the history of his own time. After twelve years of a quiet life he again began his travels, chiefly for the purpose of collecting further matter for his *Chronicle*, and he again visited England after a lapse of forty years. Little is known of the closing part of his life, which is said to have terminated at Chimay. His *Chronicle*, which reaches down to 1400, gives a singularly vivid and interesting picture of his times, and also presents his own character in a pleasing light. The best edition of his *Chronicle* is that of Buchon, which also contains his collected *Poésies* (Paris, 1835-36, three vols.). The earliest, and in some respects the best, English translation is that of Lord Berners (London, 1525), although that of Thomas Johnes (1803-5) is more exact.

Frome (from or fröm), or FROME-SELWOOD, a town of England, County Somerset, on a small river of the same name, 19 miles southeast of Bristol. The staple manufactures are woolen cloths. Pop. (1911) 10,901.

Fronde (frond), a French party during the minority of Louis XIV, which waged civil war against the court party on account of the heavy fiscal impositions laid on the people by Cardinal Mazarin, whom the queen-mother had appointed prime-minister after the decease of Louis XIII (1648). At the head of the Fronde stood the Cardinal de Retz (q. v.), and latterly the Prince Louis Condé. The result of this contest, which lasted from 1648 to 1654, served only to strengthen the royal power. The name is from Fr. *fronde*, 'a sling,' a member of the parliament having likened the party to boys slinging stones in the streets, but who dispersed on the appearance of the authorities.

Frontenac (frant'nák), LOUIS DE BUADE, COMTE DE (1620-98), the greatest of the governors of New France (Canada). Entering the military service of France at an early age he saw service in Italy, Flanders and Germany, and was selected by Turenne (q. v.) to lead troops sent to relieve Canada. He succeeded Courcelles as governor in 1672, built Fort Frontenac the following year, but because of his quarrels with the colonists he was recalled in 1682. Regaining the king's favor he was restored to his former position in 1688 and carried out a vigorous war against the English settlements in New York and their Indian allies, the Iroquois. In 1690 he defeated Admiral Phipps and the English fleet before Quebec, in commemoration of which Louis XIV caused a medal to be struck. He encouraged La Salle in colonizing the Mississippi valley and established posts at Niagara and Mackinac and Illinois. Frontenac followed up his successes by invading the Mohawk country, leading an expedition in person against

Onondaga and Oneida; while on the coast he ravaged Maine and New York.

Frontinus (fron-tī'nus), SEXTUS JULIUS, a Roman of patrician descent, born about A.D. 40; died 106. He was governor of Britain from 75 to 78, and distinguished himself in the wars of the Silures. He appears to have been twice consul, and was appointed by Nerva to superintend the aqueducts, on which he also wrote. His *De Strategematibus*, a treatise on war, and his *De Aquæductibus Urbis Romæ* are well known.

Fronto (fron'tō), MARCUS CORNELIUS, a Roman orator and rhetorician of the second century after Christ, born at Cirta in Numidia. Having removed to Rome, he won the special favor of Hadrian and Antoninus Pius, and was entrusted with the education of the imperial princes Marcus Aurelius and Lucius Verus. His extant remains consist chiefly of some letters to these princes.

Froschdorf (frosh'dorf; called by the French *Frohsdorf*), a village in Lower Austria, on the river Leitha, about 30 miles from Vienna. It is remarkable for its magnificent castle, which has acquired a kind of political importance since 1844, when it became the headquarters of the Bourbon party. It was the favorite residence of the late Comte de Chambord, who greatly improved and beautified the interior.

Frosinone (frō-zi-nō'nā), a town of Italy, near the left bank of the Cosa, 50 miles E. S. E. of Rome. Pop. of commune 11,191.

Frost is the name we give to the state of the weather when the temperature is below the freezing point of water (32° F.). The intensity of the cold in frost is conveniently indicated by the popular expression so many *degrees of frost*, which means that the temperature of the atmosphere is so many degrees below the point at which the freezing of water commences. Frost is often very destructive to vegetation, owing to the fact that water, which is generally the chief constituent of the juices of plants, expands when freezing, and bursts, and thus destroys the vesicles of the plant. In the same way rain-water, freezing in the crevices of rocks, breaks up their surfaces, and often detaches large fragments. Hoar-frost is frozen dew. It may either freeze while it is falling, when it is found loosely scattered on the ground; or being deposited as dew in the early part of the night it may freeze during a subsequent part of it, owing to radiation. It is generally seen most profusely in spring and autumn; because at those times, while on clear nights the cold is sufficient to freeze the dew, the days are at the same time sufficiently warm to cause a very considerable quantity of moisture to evaporate into the air.

Frostbite, a condition caused by the action of frost on the human body. It is generally local and partial, varying from ordinary chilblain to complete death of the part frozen. The simplest treatment consists in slowly coaxing back the vitality by friction.

Frostburg (frost'burg), a town of Allegany Co., Maryland, 11 miles west of Cumberland. It is in a mountainous region, and coal is extensively mined. It has iron and firebrick works and is the seat of a state normal school. Pop. 6028.

Frosted Glass, glass roughened on the surface, so as to destroy its transparency, in consequence of which the surface has somewhat the appearance of hoar-frost.—The term *frosted* is also applied to the dead or lusterless appearance of gold and silver jewelry when the surface is unpolished.

Frothfly, FROTH-HOPPER, the common name of insects of the family Cercopidæ, the larvæ and pupæ of which are found in frothy exudation on plants. See *Cuckoospit*.

Frothingham (froth'ing-am), OCTAVIUS B., Unitarian theologian, born at Boston, Massachusetts, in 1822; died in 1895. He was ordained in 1847 and became pastor of the Third Unitarian Society in New York about 1859. He was a man of broad culture and excellent intellectual powers, and very radical in his views, resembling Theodore Parker in his radicalism. He wrote various works, including *Transcendentalism in New England*, *The Religion of Humanity*, *The Parables*, etc.

Froude (frōd), JAMES ANTHONY, historian and miscellaneous writer, born at Totness, Devonshire, in 1818. He was educated at Oxford, was elected fellow of Exeter College, and received deacon's orders. He resigned his fellowship and withdrew from the orders on the publication of his *Nemesis of Faith* (1848). Between the years 1856 and 1869 appeared his great work, *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*, which was very popular, though it received but doubtful approval from historians. He was for some time editor of *Fraser's Magazine*, to which he contributed many articles, as well as to other

periodicals. He was elected rector of St. Andrews University in 1869. He was made literary executor to Carlyle, and his *Life of Carlyle*, and *Carlyle's Reminiscences*, and *Letters and Memorials of Jane Welsh Carlyle*, as edited by him, provoked an extraordinary amount of controversy. He died in 1894.

Fructidor (fruk'ti-dôr), the twelfth month of the French republican calendar (dating from September 22, 1792), beginning August 18, and ending September 16th.

Fruit (frōt), in botany, the seed of a plant, or the mature ovary, composed essentially of two parts, the pericarp and the seed. In a more general sense the term is applied to the edible succulent products of certain plants, generally covering and including their seeds. The hardier sorts of fruits indigenous to the United States, or which have been cultivated to any important extent there, are the apple, pear, plum, cherry, apricot, peach, and nectarine; the gooseberry, currant (red, white, and black), raspberry, strawberry, mulberry. The more important fruits requiring a warm climate are the fig, date, grape, orange, lime, banana, tamarind, pomegranate, citron, breadfruit, olive, almond, melon, cocoanut, etc. Some fruits are of immense economic importance, either from supplying food to great numbers of people (dates) or from furnishing beverages in extensive use (as wine from the grape).

Fruitarians, the name applied to those persons who advocate a diet consisting solely of fruit and nuts. As fruits contain little protein, the nuts are necessary to a balanced ration. Compare *Vegetarianism*.

Fruit-pigeon, the name given to the pigeons of the genus *Carpophăgus*, birds of very brilliant plumage, occurring in India, the warmer parts of Australia, etc. They are so called because they feed entirely on fruit.

Frustum (frus'tum), in geometry, the part of a solid next the base, left by cutting off the top portion by a plane parallel to the base; or the part of any solid between two planes, which may be either parallel or inclined to each other, as the *frustum* of a cone, of a pyramid, or of a sphere, which latter is any part comprised between two parallel sections.

Fry (frī), Elizabeth, philanthropist, the third daughter of John Gurney, of Earlham Hall, near Norwich, England, was born in 1780; died at Ramsgate in 1845. In her eighteenth year a sermon preached by William Savery, an American Quaker, at Norwich, had the effect of turning her attention to serious things, and making her adopt decided views on religious matters. About this time also she made the acquaintance of Joseph Fry, a London merchant and a strict Quaker, to whom she was married in 1800. In 1810 she became a preacher among the Friends. Having paid a visit to Newgate in 1813, she was so impressed by the scene of squalor, vice, and misery which she there witnessed that the amelioration of prison life became with her a fixed object. In 1817 she succeeded in establishing a ladies' committee for the reformation of female prisoners in Newgate, along with a school and manufactory in the prison, the results of which proved eminently satisfactory. These improvements were shortly afterwards introduced by her means into other prisons. In the pursuit of her philanthropic labors she made tours through various parts of the United Kingdom, and also visited France, Belgium, Germany, and Holland.

Frye (frī), William P., Senator, was born at Lewiston, Maine, in 1831. He studied law, became attorney-general of Maine in 1867, and member of Congress in 1871. In 1881 he was elected to the Senate, and was a member of the Paris Peace Conference after the War of 1898. He was continuously reëlected and died in 1911.

Fuad Pasha (fō'ăd pa-shâ'), Mehemed, a Turkish statesman and man of letters, was born at Constantinople in 1814; died at Nice in 1869. His diplomatic career took him to London, Madrid, and St. Petersburg; he was four times minister of foreign affairs, and for five years grand vizier; and was the chief support of the reform party in the Turkish empire. He wrote poetry, political pamphlets, and a Turkish grammar, which has been translated into several languages.

Fuca (fū'ka), Strait of. See *Juan de Fuca, Strait of.*

Fucaceæ (fū-kā'se-ē), a nat. order of dark-colored algæ, consisting of olive-colored inarticulate seaweeds, distinguished from the other algæ by their organs of reproduction, which consist of archegonia and antheridia, contained in common chambers or conceptacles united in club-shaped receptacles at the ends or margins of the fronds. Fucaceæ exist in all parts of the ocean, and, though all are probably occasionally attached, they may persist as floating masses, like the gulf-weed. *Macrocystis pyrifĕra* is said to have fronds of 500 to 1500 feet long. See *Fucus*.

Fu-chow (fō-chou). See *Foo-chow*.

Fuchsia (fū'shi-a; named after the discoverer *Leonard Fuchs*, a German botanist), a genus of beautiful flowering shrubs, natives of South America, Mexico, and New Zealand, nat. order Onagraceæ, characterised by having a funnel-shaped, colored, deciduous, four-parted calyx, sometimes with a very long tube; four petals set in the mouth of the calyx-tube and alternating with its segments; eight exserted stamens, and a long style with a capitate stigma. This is one of our most common decorative greenhouse plants, while the hardy varieties out of doors in the open border form an important feature with their drooping, elegant habit and their wonderful profusion of flowers.

Fucino, or Celano (fō'chē-nō, chel-ā'nō; Latin, *Fucinus Lacus*), formerly a lake of Southern Italy, about 11 miles long and 5 miles broad, 2181 feet above sea-level in the province of Aquila in the Central Apennines. As the lake often rose and submerged the neighboring lands, the Emperor Claudius caused a tunnel to be constructed to carry off its surplus waters into the Garigliano. This vast work was soon allowed to fall into disrepair. Between 1852 and 1875, however, this work was repaired and enlarged by a company, and the lake has now been thoroughly drained, and 36,000 acres of rich arable land reclaimed.

Fucus (fū'kus), a genus of seaweeds, family Fucaceæ, comprising various common seaweeds which have a flat or compressed forked frond, sometimes containing air-vessels. Many of the species are exposed at low water; they form a considerable proportion of the seaweeds thrown upon some coasts, and are used for manure and for making kelp. Most contain iodine.

Fuel (fū'el), carbonaceous matter, which may be in the solid, the liquid; or the gaseous condition, and which, in combining with oxygen, gives rise to the phenomenon of heat, the heat being made use of for domestic, manufacturing, and other purposes. The essential heat-producing elements of a fuel are carbon and hydrogen, and the fuel is valued in the measure in which these two elements are present. Oxygen, nitrogen, sulphur and phosphorus occur incidentally in most fuels. The inorganic matter contained in a fuel constitutes the ash. Fuels may be conveniently divided into three classes: Solid, as coal, wood, peat, coke and charcoal. Petroleum in its various forms, vegetable and animal oils, and alcohol are the liquid fuels most in use. The chief gaseous fuels are coal gas, water gas, natural gas and producer gas. Among the solid fuels coal is by far the most important. The common division of coal is into anthracite and bituminous. Bituminous coal is again divided into: anthracite; cooking and furnace coals; gas coal; non-cooking, long-flame coal; lignite, or brown coal; cannel coal. Anthracitic coal differs little from anthracite, containing 90 to 93 per cent. of free carbon, whereas anthracite contains 98 per cent. American anthracite is a hard, dense coal, with a metallic lustre, and burns with a smokeless flame, giving an intense heat. Gas coal contains from 80 to 85 per cent. of carbon, and is rich in gas. Lignite is a coal intermediate between peat and bituminous coal, often showing a woody structure. Cannel coal is also a large gas-producing coal.

Wood long held sway as the principal source of heating, but is not now in common use except in remote country districts. Coke and charcoal, the products respectively of coal and wood, are also much in use as fuel.

The chemical examination of fuels includes the determination of (1) moisture, (2) ash, (3) coke, (4) volatile matter, (5) fixed carbon in coke, (6) sulphur, (7) chlorine, (8) phosphorus. Moisture is determined by noting the loss in weight when a small sample is heated at 100 degrees for about one hour. The ash is determined by heating a sample in a muffle furnace until all the combustible matter has been burned off. The ash, which generally contains silica, oxides of the alkaline earths, ferric oxide (which gives the ash a red color), sulphur, etc., is analyzed by the ordinary gravimetric methods. The determination of coke is very important on account of the conclusions concerning the nature of the coal which it permits to be drawn. It may be (1) pulverulent, (2) slightly fritted, (3) spongy and swelled, (4) compact. A compact coke is yielded by good coking coals, and is usually large in amount.

Liquid fuels are comprised under the head of petroleum and its products, as naphtha, gasoline, kerosine, tar and tar refuse, etc.; alcohol, and for special uses, chemical derivatives such as amyl-acetate. Crude petroleum consists of about 85 per cent. carbon and 15 per cent. hydrogen. It thus provides a very efficient fuel, easily regulated, quickly lighted or extinguished, insuring a steady, intense heat and perfect combustion. To obtain proper combustion of oil fuel, the oil must be converted into spray, which is done by a steam jet or atomiser. Within the last

few years alcohol has come prominently into notice as a source of heat. It has been shown that crude denatured alcohol as a fuel for use in internal combustion engines is of higher efficiency than the lighter petroleum oils.

Among gaseous fuels, ordinary illuminating gas holds a prominent place from its use in small engines and shop and domestic appliances. In many large manufactories producer gas is being extensively used, and there is a growing tendency to introduce it in all industries where high temperatures are required and where large quantities of coal are consumed. Its advantages are demonstrated in the easy regulation of combustion; economy in labor, fuel and heat; and the high temperature obtained. Producer gas is derived from the decomposition of water or steam in contact with incandescent carbon. The first chemical reaction obtained is the formation of carbon dioxide and the liberation of hydrogen; this is succeeded by the formation of carbon monoxide, a non-luminous gas, but one possessing high calorific power. A plant for manufacturing the gas consists of a producer, or furnace; a vaporizer, for absorbing the waste heat of the gas to make the steam needed; a cooling washer; and a purifier, to remove the tar. Oil gas is also used as a fuel; that is, gas made from crude oils.

Prepared fuels are made from coal in a powdered condition. The coal after being washed is mixed and ground with tar, pitch or other binding material in the proportion of about 90 parts of coal to 10 of the binder. The mixture is then melted and molded into blocks of a size easy to handle. Attention has been directed to the utilisation of coal in the form of dust. The advantages claimed for the direct use of coal dust are: complete combustion and the consequent elimination of smoke, and the greater efficiency of the fuel; ability to use a cheap grade of coal; the enlargement of furnace capacity, and small labor cost. One of its disadvantages is that ash dust is discharged into the air in large quantities. Only the bituminous coals have been successfully used alone.

Fuente (fu-en'tā), with affixes, the name of numerous small towns in Spain. The most important is FUENTE-DEL-MAESTE, a town, province of Badajoz, near the right bank of the Guadajira, 32 miles S.S.E. of Badajos. Pop. 6928.

Fuero (fu-ā'rō), a Spanish word signifying jurisdiction, law, privilege, and applied historically to the written charters of particular districts, towns, etc. In 1833 a civil war broke out in the Basque provinces, in assertion of the fueros of that district, which lasted ten years, and was only pacified by the formal recognition of the Basque privileges in 1844 by the queen and cortes of Spain. The Basque fueros, however, were finally abrogated in 1876 as a result of the Carlist rising.

Fuertes (fwār'tās), ESTEVAN ANTONIO (1838-1903), an American civil engineer and educator, born at Porto Rico, of mixed Spanish, French and Irish race. He graduated from the Troy (New York) Polytechnic Institute in 1857 and returning to Porto Rico entered the royal corps of engineers. He was for a time director of public works in Porto Rico, but resigned and went to New York, where he rendered special services in the work of the Croton aqueduct; being later engaged as consulting engineer to the legislative commission which investigated the contracts of William M. Tweed, the notorious political 'boss' of New York City. In the government's investigation of the desirability of a Nicaragua canal he was engineer-in-chief. He became dean of the school of engineering in Cornell University in 1873; director of the college of civil engineering, 1890-92.

Fuerteventura (fwār-tā-vān-tō'ra), one of the Canary Islands, separated from Lancerota by the Strait of Bacayna. Cabras on the east coast has a good harbor. Area, 758 sq. m. Pop. about 11,660.

Fugger Family (fōg'gėr), THE, a distinguished German family, early admitted among the hereditary nobility, and now represented by two main lines of princes and several minor noble branches. The founder of this family was JOHANN FUGGER, a master-weaver who settled in Augsburg in 1368 and acquired much property. His descendants became leading bankers, merchants, and mine-owners, were liberal and public-spirited men, patrons of art, and several of them became distinguished soldiers and statesmen. Among the most eminent of the family was JAKOB FUGGER (1459-1525), who carried on great commercial operations, advanced money to the Emperors Maximilian and Charles V, and by the former was raised to the rank of nobleman, being also imperial councilor under both. Charles V raised Jakob's two nephews, Raimund and Anton Fugger, to the dignity of counts. He also invested them with the estates of Kirchberg and Weissenhorn, which had been mortgaged to them, granted them a seat at the imperial diet, and letters giving them princely privileges. Subsequently the highest places

of the empire were held by the Fuggers, and princely families thought themselves honored by their alliance.

Fugitive Slave Law, a law for the return of fugitive slaves to their masters, was passed by the United States Congress in 1793, and a much more stringent one in 1850, making it a penal offense to aid a slave in his flight and requiring all persons called upon to assist in his capture. This law caused much hostile feeling in the Northern States, few Northerners would obey its requirements, and it was one of the leading causes that brought on the Civil War.

Fugue (fūg), a musical term, derived from the Latin word *fuga* (a flight), and signifying a polyphonic composition constructed on one or more short subjects or themes, which are manipulated according to the laws of counterpoint and introduced from time to time with various contrapuntal devices, the interest in these frequently centering in the themes being sustained by diminishing the interval of time at which they follow each other, and monotony being avoided by the occasional use of episodes, or passages often to free treatment.

Fuhnen. See *Funen.*

Fuji-Yama (fō'je-yä'ma), or **Fusi-Yama,** a dormant volcano of a symmetrical, cone-like shape, in the island of Hondo, Japan, the sacred mountain of the Japanese. It has been quiescent since 1707; is 12,400 feet in height, and is visible in clear weather for a distance of nearly a hundred miles.

Fula, Fulbe. See *Fellatah.*

Fulcrum (ful'krum), in mechanics, the support of fixed point about which a lever turns. See *Lever.*

Fulda (fōl'da), a Prussian town, province of Hessen-Nassau, on a river of the same name, 54 miles S. S. E. of Cassel. It is irregularly built; contains a cathedral, a handsome modern edifice; a castle, once occupied by the prince bishops, and other interesting buildings; and has manufactures of cotton, woolen, and linen goods, etc. The town derives its origin from a once-celebrated abbey founded by St. Boniface (Winfried), the apostle of Germany, in 744. Pop. 16,900.

Fulgora (ful'gu-ra), the generic name of the lantern-flies (which see).

Fulgurite (ful'gū-rīt), any rocky substance which has been fused or vitrified by lightning. More strictly, a vitrified tube of sand formed by the intense heat of lightning when it penetrates a mass of sand, and fuses a portion of the materials through which it passes.

Fulham (ful'am), one of the London parliamentary boroughs, bounded by the Thames and the boroughs of Chelsea, Kensington, and Hammersmith. It contains the palace of the Bishop of London. Pop. (1911) 153,825.

Fulica (fū'li-ka). See *Coot.*

Fuller (ful-ler), Margaret. See *Ossoli* (*Margaret Fuller*).

Fuller, Melville Weston, an eminent American jurist, was born in Augusta, Maine, 1833; graduated at Bowdoin College, 1853, and at Harvard Law School, 1855. After practising in his native town for a little over a year, he moved to Chicago, where he was very successful, and until 1880 took an active part in politics. In 1888 President Cleveland appointed him chief justice of the United States Supreme Court, a position held by him till his death in 1910.

Fuller, Thomas, an eminent historian and divine of the Church of England, born in 1608 at Aldwinkle, in Northamptonshire; died in 1661. He graduated at Queen's College, Cambridge, held several clerical positions, and in 1643 joined the king at Oxford during the civil war. Becoming chaplain to Sir Ralph Hopton, of the army, he began the collection of materials relating to English history and antiquities. At the close of the war he took refuge in Exeter, and was appointed chaplain to the infant Princess Henrietta Maria. Shortly before the restoration he was reinstated in his prebendal stall, and soon after that event was made one of the king's chaplains. Several of his writings are English classics, remarkable for quaintness of style, wit, sagacity, and learning. Among the more important are: *History of the Holy War; The Holy and Profane State; Pisgah Sight of Palestine; Church History of Britain;* and the *Worthies of England,* a production valuable alike for the solid information it affords relative to the provincial history of the country and for the profusion of biographical anecdote and acute observation on men and manners.

Fuller's Earth (ful'erz), a variety of clay or marl, compact but friable, unctuous to the touch, and of various colors, usually with a shade of green. It is useful in scouring and cleansing cloth, as it imbibes the grease and oil used in preparing wool. It consists of silica 50 per cent., alumina

20, water 24, and small quantities of magnesia, lime, and peroxide of iron. There are extensive beds of this earth in England and elsewhere.

Fulling-mill (ful'ing), a mill for fulling cloth by means of pestles or stampers, which beat and press it to a close or compact state, and cleanse it. The principal parts of a fulling-mill are the wheel, with its trundle, which gives motion to the tree or spindle, whose teeth communicate that motion to the pestles or stampers, which fall into troughs, wherein the cloth is put, with fuller's-earth, to be scoured and thickened by this process of beating.

Fulmar (fōl'mar), a natatorial or swimming oceanic bird (*Fulmārus glaciālis*) of the family Procellariidæ or petrels, about the size of a large duck. It inhabits the northern seas in prodigious numbers, breeding in

Fulmar (*Fulmārus glaciālis*).

Iceland, Greenland, Spitzbergen, the Shetland and Orkney Islands, the Hebrides, etc. It feeds on fish, the blubber of whales, and any fat, putrid, floating substance that comes in its way. It makes its nest on sea-cliffs, in which it lays only one egg. The natives of St. Kilda value the eggs above those of any other bird. The fulmar is also valued for its feathers and down, and for the oil found in its stomach, which is one of the principal products of St. Kilda. When caught or assailed it lightens itself by disgorging the oil from its stomach. There is another and larger species found in the Pacific Ocean.

Fulmination (ful-mi-nā'shun), a term used in chemistry to denote the sudden decomposition of a body by heat or percussion, accompanied by a flash of light and a loud report. Fulminating compounds, or fulminates, are explosive compounds of fulminic acid with various bases, such as gold, mercury, platinum, and silver. The old fulminating powder is a mixture of sulphur, niter, and potash. Fulminate of mercury forms the priming of percussion caps.

Fulminic Acid (ful-min'ik), a peculiar acid, known only in combination with certain bases, and first discovered along with mercury and silver, forming detonating compounds.

Fulton (ful'tun), a city, capital of Calloway County, Missouri, 26 miles N. E. of Jefferson City. Coal is extensively mined, and there are valuable mineral springs in the vicinity. There is a large fire-brick factory. Here is a State Insane Hospital, a School for the Deaf, and several colleges. Pop. 5228.

Fulton, a village of Oswego County, New York, 24 miles N. W. of Syracuse. It has flour, woolen, pulp, and paper mills, machine shops, gunworks, knifeworks, etc. Pop. 10,480.

Fulton, Robert, the inventor of the first practicable steamboat, was born in Lancaster County, Pennsylvania, in 1765; died 1815. He adopted the profession of portrait and landscape painter, and in his twenty-second year proceeded to England for the purpose of studying art under West. There he became acquainted with the Duke of Bridgewater, Earl Stanhope, and James Watt, and was led to devote himself to mechanical engineering. In 1794 he took a patent for a double-inclined plane, which was intended to supersede locks on canals; and he also patented a mill for sawing marble, machines for spinning flax and making ropes, a dredging-machine, etc. In 1797 he went to Paris, where he produced the first panorama that was exhibited there. He also, after some trials, was successful in introducing a boat propelled by steam upon the Seine. During a visit to Scotland he had seen and obtained drawings of the *Charlotte Dundas*, a steam-vessel which had plied with success on the Forth and Clyde Canal. His chief occupation in Paris, however, was the invention of torpedoes for naval warfare. He returned to America in 1806, and built a steamboat of considerable dimensions, which began to navigate the Hudson River in 1807. Its progress through the water was at the rate of 5 miles an hour. It was a considerable improvement over previous efforts at steam navigation and the steamboat was soon common on the rivers of the United States. In 1814 he constructed the first war steamship, and was engaged upon an improvement of his submarine torpedo when he died.

Fumage (fū'maj; Lat. *fumus*, smoke), a tax on every house with a chimney, mentioned in Domesday Book, and commonly called smoke-farthings. It is supposed to have been the origin of the *hearth-money* im-

posed by Charles II, and repealed by William and Mary.

Fumaria (fū'ma-ri-a). See *Fumitory*.

Fumariaceæ (fū-ma-ri-ā'se-ē), a small nat. order of exogenous plants, closely allied to Papaveraceæ. The species are slender stemmed, herbaceous plants, generally erect, though some climb by means of their twisting leaf-stalks. Many species are objects of cultivation by the gardener for the sake of their showy flowers. All are astringent and acrid plants, and are reputed diaphoretics and aperients. They inhabit the temperate and warm regions of the northern hemisphere and South Africa.

Fumigation (fū-mi-gā'shun), the application of fumes, gas, or vapor for the purpose of disinfecting houses, clothes, and the like. The fumes of heated vinegar, burning sulphur, or the like, formerly employed, are of but little value. For really active processes see *Disinfectants*.

Fumitory (fū'mi-tu-ri), the common name of *Fumaria*, a genus of plants, nat. order Fumariaceæ. Several species are known, natives of Europe, Aisa, and America. The common fumitory is a very frequent weed in our cornfields, and also found in highly-cultivated gardens. They are slender annual herbs with much-divided leaves and purplish flowers in racemes at the top of the stem or opposite the leaves. *F. officinalis*, the best-known species, was at one time much used in medicine for scorbutic affections, etc., but its use is now discontinued.

Funaria (fū-nā'ri-a), a genus of mosses, one of which, *F. hygrometrica*, is common in Britain, especially on spots where a wood-fire has been, and grows in all parts of the world.

Funchal (fun-shal'), the capital of the Island of Madeira, situated on a bay on the south coast. It stretches for nearly a mile along the shore, and presents a thoroughly European appearance. It is a coaling station for steamers, and is much resorted to by invalids afflicted with pulmonary complaints. Pop. 20,850.

Function (funk'shun), in mathematics, a quantity so connected with another that no change can be made in the latter without producing a corresponding change in the former, in which case the dependent quantity is said to be a *function* of the other: thus, the circumference of a circle is a *function* of the diameter: the area of a triangle is a function of any two of the sides and the angle they contain. In order to indicate in a general way that one quantity y is a function of another x the notation $y = f(x)$, or something similar, is adopted; thus, if u be the area of a triangle, x and y two of the sides, and θ the contained angle, we should write $u = \phi(x, y, \theta)$.

Function, the specific office or action which any organ or system of organs is fitted to perform in the animal or vegetable economy.—*Vital functions*, functions immediately necessary to life, as those of the brain, heart, lungs, etc.—*Natural* or *vegetative* functions, functions less instantly necessary to life, as digestion, absorption, assimilation, expulsion, etc.—*Animal functions*, those which relate to the external world, as the senses, voluntary motions, etc.

Fundamental Note (fun-da-men'tal), in music, the lowest or gravest note that a string or pipe can sound.—*Fundamental tones* are the tones from which harmonics are generated.

Fundi, Fun-dungi (fun'dung'gi), a kind of grain allied to millet (the *Paspalum exile*), much cultivated in the west of Africa. It is light and nutritious, and has been recommended for cultivation in Britain as food for invalids especially.

Funds, Public, and Funded Debt, money lent to government constituting a national debt. The several debts contracted by the United States have been for war expenditure. In 1860, at the outbreak of the Civil war, our national debt was stated at $64,842,287. In 1866 it reached the enormous figures of $2,773,236,173. The money was borrowed at varying rates of interest, and a very large portion of the debt consisted of legal tender notes and other obligations bearing no interest. The debt was created rapidly, but its reduction excited the admiration of the world; in several instances $100,000,000 being paid in a single year. It is now reduced within easily manageable limits, amounting, less cash in the treasury, to about $1,000,000,000.

Fundy (fun'di), Bay of, a large inlet of the Atlantic, on the east coast of North America, separating Nova Scotia from New Brunswick. At its inner extremity it divides into Chignecto Bay, and Minas Channel and Basin, with smaller continuations. It is noted for its impetuous tides, which cause a rise and fall of from 12 to 70 feet, and the navigation is dangerous. At its entrance are Grand Manan and other islands. A ship-railway is being constructed

to connect Chignecto Bay with Northumberland Strait.

Funen (fū'nen; Danish, *Fyen*), the largest of the Danish islands except Seeland, from which it is separated by the Great Belt, and from Jutland by the Little Belt; circuit, about 185 miles; area, 1132 square miles. The interior towards the west is covered by a range of low hills, but, with this exception, it is composed of large and fertile plains under good cultivation. The largest stream is the Odense, which has a course of about 36 miles. The chief towns are Odense, Svendborg, and Nyborg. Pop. with Langeland and Arroe, 240,359.

Funeral Rites (fūn'er-al rīts), the rites and ceremonies connected with the disposing of the dead. Among the ancient Egyptians the friends of the deceased put on mourning habits, and abstained from gayety and entertainments for from forty to seventy days, during which time the body was embalmed. Among the ancient Jews great regard was paid to a due performance of the rites of sepulture; and among the ancient Greeks and Romans to be deprived of the proper rites was considered the greatest misfortune that could happen. The decorous interring of the dead with religious ceremonies indicative of hopes of a resurrection is characteristic of all Christian nations. With Roman Catholics the body is the object of solemn ceremonial from the moment of death until interment. The Church of England funeral service is too well known to require any notice. Among other Protestant bodies there is usually no formal service, but prayer is offered up or an ordinary religious service held before the interment in the house of the deceased or his relatives, or, in the case of a public funeral, in some public place. The practice of delivering funeral orations at the interment of the dead by laymen is common in France, and not unfrequent in America. In Ireland the wake, or watching of the dead, by the lower classes, is usually a scene of tumult and drunkenness. For many curious customs at funerals see Brand's *Popular Antiquities* and Strutt's *Manners and Customs;* see also *Burial.*

Fünfkirchen (fünf'kirh-ĕn; 'Five Churches'), a town of the Austrian Empire, in Hungary, on the slope of a hill, 105 miles s. s. w. Budapest. It is the see of a bishop, and the cathedral, a handsome Gothic structure, is one of the oldest ecclesiastical edifices in Hungary. Fünfkirchen once had a flourishing university, attended by 2000 students. Its industries comprise fine pottery, woolens, leather, liqueurs, etc. In the neighborhood brown coal and black marble are worked. Pop. (1911) 49,822.

Fungi (fun'jī), a large natural order of cryptogamous or flowerless plants, comprehending not only the various races of mushrooms, toadstools, and similar plants, but a large number of microscopical plants growing upon other plants, and substances which are known as molds, mildew, smut, rust, brand, dry-rot, bacteria, etc. Fungi agree with algæ and lichens in their cellular structure, which is, with very few exceptions, void of anything resembling vascular tissue; but differ from them in deriving their nutriment from the body on which they grow, not from the medium by which they are surrounded. They are among the lowest forms of vegetable life, and, from the readiness with which they spring up in certain conditions, their germs are supposed to be floating in the atmosphere in incalculable numbers. Many diseases are produced by fungi. Fungi differ from other plants in being nitrogenous in composition, and in inhaling oxygen and giving out carbonic acid gas, in these respects approximating to the similar animal functions. Berkeley divides fungi into two great sections, the first having the spores naked, and comprising agarics, boleti, puffballs, rust, smut, and mildew; the second, comprising the morels, truffles, certain molds, etc., in which the spores are in sacs (*asci*). These are again subdivided into six principal orders, all formed on the mode in which the spores are borne, namely:—1. *Ascomycetes*, comprising a vast number of the black pustular growths abundant on dead wood, bark, twigs, leaves, etc. Among these are the mildews (*Erysiphe*), the black mildews (*Capnodium*), and the whole great tribe of *Sphæriæ*. The truffles (*Tuber*), morels (*Morchella*), and *Helvellæ* also belong to this division. 2. *Physomycetes*, a small group comprising the true molds. 3. *Hyphomycetes*, including the bacteria of disease and the great host of minute molds which cover almost every substance exposed to dampness. To it also belong the mold of the potato-rot (*Botrytis infestans*) and many which induce decay in fruit (*Oïdium*), the bread and cheese molds (*Penicillium, Aspergillus*), and the yeast and vinegar plants, which are submerged mycelia of *Penicillium*. 4. *Coniomycetes*, comprehending the whole family of rusts, smuts, and bunt (*Puccinea, Uredo, Ustilago, Tilletia, Æcidium*, etc.). 5. *Gasteromycetes*, including the whole tribe of puffballs, as well as the subterranean fungi which look

like truffles, but are dusty and smutty within. 6. *Hymenomycetes*, typical and well-known examples of which are found in the mushrooms and sapballs. Fungi occur in every part of the earth where the cold is not too intense to destroy the spawn, though they abound most in moist, temperate regions where the summer is warm. Several species afford excellent and abundant food, others are valuable in medicine, while many are deadly poisons and many, plant pests.

Fungicides (fun'ji-sīds), substances used to prevent or destroy fungous growths on plants. The marked extension of injurious parasitic growths has attracted wide attention to the subject of fungicides, and the United States Department of Agriculture, has issued bulletins on fungicides.

Funnel (fun'el), the shaft or hollow channel of a chimney through which smoke ascends; especially in *steamships*, a cylindrical iron chimney for the boiler-furnaces rising above the deck.

Funston (funs'ton), FREDERICK, soldier, was born in Ohio in 1865. In 1898 he joined the army of the Philippines. His most famous exploit was the capture of Aguinaldo, the Philippine leader. In 1916, as major-general, he commanded the forces on the Mexican border. He died February 19, 1917.

Fur. Fur is the fine, soft, hairy covering of certain animals. The term is sometimes distinctively applied to such coverings when prepared for being made into articles of dress, etc., while the name of peltry is given to them in an unprepared state or when merely dried. The animals chiefly sought after for the sake of their furs are the beaver, raccoon, muskrat, squirrel, hare, rabbit, chinchilla, bear (black, gray, and brown), otter, sea-otter, seal, wolf, wolverine or glutton, marten, ermine, lynx, coypou (nutria), polecat (fitch), opossum, fox, etc. (See under proper headings.) All the preparation that skins require before being sent to the market is to make them perfectly dry, so as to prevent them from putrefying. This is done by exposing them to the heat of the sun or a fire. The small skins are sometimes previously steeped in a solution of alum. When stored in large quantities they must be carefully preserved from dampness, as well as from moths. The fur-dresser, on receiving the skins, first subjects them to a softening process. He next cleans them from loose pieces of the integument by scraping them with an iron blade. Finally, the fur is cleaned and combed, after which it is handed over to the cutter, who cuts the furs out into the various shapes required to make the different articles desired.

Fur Trade. In Europe the fur trade is fed chiefly by Russia, which yields great quantities of furs, especially in the Asiatic portions of her dominions. Austria, Turkey, Scandinavia, etc., also yield a certain quantity. The fur trade of America has long been highly important, and has given origin to several great trading companies, of which the Dutch East India Company was first. The French early took up the fur trade in Canada, and their chain of forts and trading posts at one time extended from Hudson Bay to New Orleans. Quebec and Montreal were at first trading posts. In 1670 Charles II granted to Prince Rupert and others a charter empowering them to trade exclusively with the aborigines of the Hudson Bay region. A company, then and after called the *Hudson Bay Company*, was formed, which for a period of nearly two centuries possessed a monopoly of the fur trade in the vast tract of country known as the Hudson Bay Territory. In the winter of 1783-84 another company was formed at Montreal, called the *Northwest Fur Company*, which disputed the right of the Hudson Bay Company, and actively opposed it. After a long and bitter rivalry the two companies united in 1821, retaining the name of Hudson Bay Company. The monopoly which had hitherto been enjoyed by the original company about Hudson Bay was now much extended; but in 1868 an act of parliament was passed to make provision for the surrender, upon certain terms, of all the territories belonging to the company, and for their incorporation with the Dominion of Canada. In 1869 the surrender was carried out, Canada paying £300,000 to the company by way of compensation. The company still possesses about 150 houses, forts, and posts in the whole region formerly belonging to it, and its operations, indeed, extend beyond British America into the United States and to the Sandwich Isles and Alaska. It employs directly somewhere about 3000 agents, traders, voyagers, and servants, besides Indian hunters. Some of its posts are situated very far north, almost approaching the Arctic Ocean. The trade in furs conducted by citizens of the United States has been extensive, but in a greater degree the result of individual enterprise than of the management of gigantic corporations. The Alaska Fur Company holds two of the Aleutian Islands in lease from the government with the sole right of killing yearly not more than 100,000 fur-seals. The fur trade centers in Lon-

don, this being the only place in which the fur is dyed.

Furca (fûr'ka), Furcahorn, an Alpine mountain in Switzerland, Canton Valais, immediately west of St. Gothard; height, 9935 feet, containing the glacier in which the Rhone has its source. The summit of the Furca Pass, over which there is a good road, is 7992 feet high.

Furies (fū'rēz), Eumenides, Erinnyes (among the Romans, *Furiæ* and *Diræ*), deities in the Greek mythology, who were the avengers of murder, perjury, and filial ingratitude. Later mythologists reckon three of them, and call them *Alecto*, *Megæra*, and *Tisiphone*. Æschylus, in his celebrated tragedy of the *Eumenides*, introduced fifty furies, and with them *Fear* and *Horror*, upon the stage. They were regarded with great dread, and the Athenians hardly dared to speak their names, but called them the *venerable goddesses*. It was by a similar euphemism the name Eumenides, signifying the soothed or well-pleased goddesses, was introduced. Erinnyes, the more ancient name, signifies the hunters or persecutors of the criminal, or the angry goddesses.

Furlong (fur'long; that is, 'furrow-length'), a measure of length, 40 rods, poles, or perches, equal to 220 yards, the eighth part of a mile.

Furlough (fêr'lō), a military term signifying leave of absence given by the commanding officer to an officer or soldier under his command.

Furnace (fur'nes), a device for the production and utilisation of heat generated by the combustion of fuel or by the conversion of electrical energy. A furnace consists of three essential parts: the fireplace, where the fuel is consumed; the hearth, where the heat is applied; and the draft. The draft may be supplied by the use of a high chimney; but where this does not prove sufficient, forced draft by means of blowers, bellows, fans, or a steam jet acting as an injector, is used. The difference of efficiency between forced and natural draft has been estimated as being 25 per cent. in favor of the former. Regulating the supply of fuel is almost as important as regulating the supply of air, and to this end self-feeding furnaces have been devised. Furnaces are conveniently divided into three classes: (1) Those in which the fuel and the substance to be heated are in intimate contact, as in kilns and blast furnaces; (2) those in which the substance is heated by the products of combustion, as in reverberatory furnaces, of which the puddling furnace is a type; (3) those in which the substance is not directly heated by the products of combustion, as in crucible, muffle, and retort furnaces. Gas furnaces are now in common use, both on account of their cleanliness and the facility of regulating the heat. For very high temperatures the electric furnace is utilized. See *Electric Furnace*.

Furneaux Islands (fêr'nō), a group belonging to Tasmania, at the east end of Bass Strait, including Flinders Island with an area of 513,000 acres; Cape Barren Island, 110,000 acres; and Clarke Island, 20,000 acres. On the west the islands have steep, rocky shores, but on the east slope gradually down to a low, sandy beach, with numerous swamps and lagoons. The inhabitants, who are few in number, many of them 'half-castes,' procure a living by seal-fishing and preserving mutton-birds, a species of petrel. The islands are named after the officer who was second in command in Captain Cook's second voyage.

Furness (fur'nes), a district of N. W. Lancashire, England, forming part of what is called the Lake District. Furness Abbey is a noble ruin situated one mile S. of Dalton-in-Furness, comprising the church walls, chapter-house, refectory, and guest-hall, the whole giving evidence of the former magnificence of the structure. It was founded in 1127 by Stephen, afterwards King of England.

Furness, William Henry, a Unitarian clergyman, born at Boston, Massachusetts, in 1802; died in 1896. He graduated from the Harvard Divinity School in 1823, became pastor of the First Unitarian Church of Philadelphia in 1825, and held this charge until 1875, when he retired as pastor emeritus. He was a close friend of Emerson, Sumner, Garrison, and Lucretia Mott, and an earnest abolitionist. He wrote extensively, his favorite theme being the life and character of Christ. His son, William Henry, Jr. (1828-67), studied art and achieved fame as a portrait painter. A second son, Horace Howard, born in 1833, studied law and was admitted to the bar in 1859. He contributed largely to legal literature, but is best known as a Shakesperean critic and editor, his variorum edition of Shakespere, of which a number of volumes have been issued, being highly esteemed. He died in 1912.

Furnivall (fur'ni-val), Frederick James, born at Egham, in Surrey, 1825; educated at University College, London, and Trinity Hall, Cambridge. He devoted his life chiefly to the study of early and middle English literature; and was mainly instrumental in

establishing the Early English Text Society, the Chaucer Society, the New Shakespere Society, the Browning Society, the Wickliffe Society, and the Shelley Society. He was the hon. secretary of the Philological Society. He edited numerous works, chiefly through the medium of some of these societies, notably the Six-Text edition of Chaucer's *Canterbury Tales*. He died in 1910.

Furruckabad. See *Farukkabad*.

Fur-seal, a name given to several of the Otariidæ or 'eared' seals which have a dense covering of fine underfur. The best known and most valuable is the fur-seal or sea-bear (*Callorhinus ursinus*) of some of the islands connected with Alaska, especially St. Paul's and St. George's, where it breeds. See *Seal*, *Fur*, and *Fur Trade*.

Fürst (fürst), JULIUS, orientalist, born of Jewish parents at Zerkowo, Prussian Poland, 1805; died at Leipzig, 1873. He devoted himself to philological science, and early showed a marvelously extensive acquaintance with Rabbinical literature. He obtained an appointment as lecturer in the University of Leipzig in 1839, and in 1864 was promoted to the rank of professor. He was the author of numerous works all connected with oriental philology, chief among which are his *Concordantiæ Librorum Sacrorum Veteris Testamenti Hebraicæ et Chaldaicæ*, and his *Hebrew and Chaldee Lexicon*. From 1840 to 1851 he edited *Der Orient*, a journal devoted to Jewish language, literature, history, and antiquities.

Fürstenwalde (fürst'en-väl-dĕ), a town in Prussia, 30 miles E. S. E. of Berlin, on the right bank of the Spree. It has a brick church of the fourteenth century, and manufactures of woolen and linen cloth, hosiery, and leather. Pop. (1905) 20,498.

Fürth (fürt), a town in Bavaria, 6 miles W. N. W. of Nürnberg, at the confluence of the Pegnitz with the Rednitz. It has important and varied manufactures, including mirrors, picture-frames, jewelry, gold-leaf, lead pencils, spectacles, machinery, etc. A battle was fought in its neighborhood in 1632. Pop. (1910) 66,533.

Furze (furz), whin, gorse, the common name of the species of the genus *Ulex*, nat. order Leguminosæ. Twelve species have been described, of which the common furse (*U. Europæus*) is a low, shrubby plant, very hardy, and very abundant in barren, heathy, sandy, and gravelly soils throughout the west of Europe. The stem is generally 2 or 3 feet high, much branched and most of the leaves converted into spines. The flowers are solitary and yellow. It often covers exclusively large tracts of country, and makes a splendid appearance when in flower. It is used as fuel, and sometimes the tops of the branches are used (especially the young tops) as fodder for horses and cattle, after having been beaten or bruised to soften the prickles.

Fu-San (fö-sän), a town and treaty port of Corea, situated on a bay of the same name, on the southeast coast. It imports silk, cotton goods and metals, and exports raw silk, rice and hides. Pop. of district 16,797.

Fusaro (fö-sa'rō), LAKE OF, a small Italian lake on the Peninsula of Baiæ, 11 miles W. of Naples. It is supposed to have been the harbor of ancient Cumæ, and is still celebrated for its oysters.

Fuse (fūz), a tube filled with combustible matter, used in blasting, or in discharging hollow projectiles, etc. There are many varieties in use, such as the fuse used in mining and quarrying, which usually consists of a tube filled with a slow-burning composition, which gradually burns down to the charge; the *concussion* and *percussion fuses* for hollow projectiles, which explode the charge when an object is struck; the *electric fuse*, which is ignited by the passage of an electric spark through it; and *time* or *mechanical fuses*, used in some forms of torpedo, and with such explosives as dynamite and guncotton.

Fusee (fū-zē'), the cone or conical part of a watch or clock, round which is wound the chain or cord. It is a mechanical contrivance for equalizing the power of the mainspring; for as the action of a spring varies with its degree of tension, the power derived from

Barrel and Fusee of a Watch.

the force of a spring requires to be modified according to circumstances before it can become a proper substitute for a uniform power. In order, therefore, to correct this irregular action of the mainspring, the fusee on which the chain or catgut acts is made somewhat conical, so that its radius at every point may be adapted to the strength of the spring.

Fuseli (fū'ze-lĭ), JOHN HENRY (original name *Füssli* or *Fuessli*; füs'lē), a painter, born in 1741 or 1742

at Zürich; died at London, and was buried in St. Paul's Cathedral, in 1825. He was educated for the church, but a political pamphlet written by him and Lavater led to his taking refuge in England in 1765, bent on a literary career. On the advice of Sir Joshua Reynolds he devoted himself to art, went to Italy and studied there for nearly nine years. He was elected a member of the Royal Academy, and made its keeper in 1804. Among his notable pictures are his contributions to Boydell's Shakespere Gallery, and forty-seven pictures from Milton. He had considerable literary gifts, and his lectures on painting are still esteemed.

Fusel-oil (fū'sel-oil), a heavy, oily, inflammable fluid with a high boiling-point, disagreeable, cutting odor, and pungent taste, which is separated in the rectification of ordinary spirit distilled from grain, malt, potatoes, molasses, beet-root, etc. The composition of this fluid depends on the materials used in the manufacture of the spirit, but it may be said to consist to a large extent of ethylic and amylic alcohol ($C_5H_{12}O$). Fusel-oil acts very deleteriously on the animal system, and this is the reason why inferior spirits are so injurious in their effects.

Fu-Shan. See *Foo-Shan*.

Fusibility (fū-zū-bil'i-ti). See *Fusing-point*, *Fusion*.

Fusible Metal (fūz'i-bl), an alloy, usually of lead, tin, and bismuth, compounded in such definite proportions as to melt at a given low temperature. In steam-engines, a plug of fusible metal is placed in the skin of the boiler, so as to melt and allow the steam to escape when a dangerous heat is reached.

Fusible Porcelain, a silicate of alumina and soda obtained from cryolite and sand, fused and worked as glass.

Fusiliers (fū-zi-lērz'), formerly soldiers armed with a fusil or light flintlock musket closely resembling a carabine. The name is given to nine or ten regiments in the British army, which differ from other regiments of the line chiefly in the busby worn by officers and non-commissioned officers.

Fusing-point (fūz'ing), the degree of temperature at which a substance melts or liquefies. This point is very different for different metals. Thus potassium fuses at 136° Fahr., bismuth at 504°, lead at 619°, zinc at 680°, silver 1832.° gold 2282°. Malleable iron requires the highest heat of a smith's forge (2912°); while cerium, platinum, and some other metals are infusible in the heat of a smith's forge, but are fusible in the flame produced by the oxyhydrogen blowpipe.

Fusion (fū'zhun), the conversion of a solid body into the liquid state by direct heat, as distinguished from solution, in which the effect is produced by means of a liquid. It is difficult, however, to draw a line between the two, for the main difference is in the temperature, and when a flux is employed all distinction disappears. The term is specially applied to the action of heat on the metals, but it is extended to any solid matter; thus the passage of ice into water at 32° F. is true fusion. There are bodies like carbon, lime, magnesia, zirconia, and other metallic oxides which are practically, if not absolutely, infusible. See *Fusing-point*.

Fusi-Yama (fö-zē-a'ma.) See *Fuji-Yama*.

Fust, Johann, a goldsmith of Mainz, associated with Gutenberg and Schöffer in connection with the origin of printing. He probably died of the plague in 1466. See *Printing*.

Fustian (fust'yan), a cotton or mixed linen and cotton fabric with a pile like that of velvet but shorter. It includes corduroy, moleskin, velveteen, etc.

Fustic (fust'ik), the wood of the *Maclura tinctoria*, a tree of the mulberry order growing in the West Indies. It is a large and handsome tree, and the timber, though, like most other dyewoods, brittle, or at least easily splintered, is hard and strong. It is extensively used as an ingredient in the dyeing of yellow, and is largely imported for that purpose.—*Young fustic* is the wood of the *Rhus cotinus* or Venice sumach, a South European shrub with smooth leaves and a remarkable feathery inflorescence. It yields a fine orange color, which, however, is not durable without a mordant.

Fusus (fū'sus), a genus of gasteropodous molluscs nearly allied to *Murex*, with a somewhat spindle-shaped univalve shell. The genus comprises many species. They are distributed over the whole world, living generally on muddy and sandy sea-bottoms.

Futehpur. See *Fatehpur*.

Futhork (fu'thork), the name given to the earliest or runic alphabet in use among the Teutonic and Gothic nations of northern Europe, so called from its first six letters, f, u, th, o, r, k. See *Runes*.

Futtipur Sikra. See *Fatehpur Sikri*.

Futtygurh. See *Fatehgarh*.

Futurist (fū'tūr-ist), in general, one who has regard to the future. The name is applied to a modern school of painting which aims at the delineation of impression rather than of observation. The futurist seeks to convey to the canvas a pictorial representations, not of the object, but of his own feelings upon regarding the object. The work of the futurists, like that of the cubists, has attracted wide attention in Europe. It became generally familiar to the American public through the International Exhibition of Art held in New York in 1913.

Fyne (fīn), Loch, an arm of the sea in Scotland, in the county of Argyle, running northwards from the Firth of Clyde for about 40 miles. Its depth varies from 12 to 50 fathoms. It is particularly celebrated for its herrings.

Fyrd (fûrd), in Anglo-Saxon England the military array or land force of the whole nation, comprising all males able to bear arms. The array of the fyrd of each shire was left to the ealdorman.

Fyt (fit), John, a Dutch painter and etcher, born at Antwerp in 1611; died there in 1661. His subjects were chiefly game, hunting pieces, dogs, fruit, flowers, etc.

Fyzabad, or Faizabad (fī-zā-bād'), a town of British India, in what was formerly the kingdom of Oude, on the Gogra, 78 miles E. from Lucknow. It was the scene of one of the outbreaks in the Indian rebellion of 1857. Pop. including cantonments, 75,085.

G

G, the seventh letter in the English alphabet. English *g hard* is a guttural mute, the 'voiced' or soft or sonant sound corresponding to the 'breathed' or hard or surd sound *k* (or *c* hard). This sound of *g* is what the letter always has before *a* (except in *gaol*), *o*, *u*, and when initial also before *e* and *i* in all words of English origin, and when final. The *soft* sound of *g*, or that which it more commonly has before *e*, *i*, and *y*, as in *gem*, *gin*, *gymnastics*, is a palatal sound the same as that of *j*, and did not occur in the oldest English or Anglo-Saxon.

G, in music, (*a*) the fifth note, and dominant of the normal scale of C, called also *sol*; (*b*) the lowest note of the grave hexachord; in the Guidonian system *gamma ut*; (*c*) a name of the treble clef, which is seated on the G or second line of the treble staff, and which formerly had the form of G.

Gabbro (gab'rō), the name given by the Italians to a rock consisting essentially of diallage and white epidote or saussurite. It is used for ornamental purposes in building, for table-tops, etc.

Gabbronite (gab'ro-nīt), GABBONITE, a mineral, a variety of scapolite, occurring in masses whose structure is more or less foliated or sometimes compact. Its colors are gray, bluish or greenish gray, and sometimes red.

Gabelle (gā-bel), a name originally given in France to every kind of indirect tax, as on wine, cloth, etc., but at a later period specially applied to the tax upon salt, which after being frequently imposed as a temporary means of raising money, became under Charles V a permanent impost. Under Henry II nine provinces and three counties purchased perpetual exemption from the tax, but it was not finally suppressed in France, by the Constituent Assembly, until 1790. About that time, out of 38,000,000 livres raised by farmers-general from this tax, 7,000,000 at most came into the treasury.

Gabes. Same as *Cabes*.

Gabilla (gā-bēl'yā), a finger or parcel of tobacco in Cuba. Thirty-six to forty leaves make a *gabilla*, *4 gabillas 1 hand*, *80 hands 1 bale*.

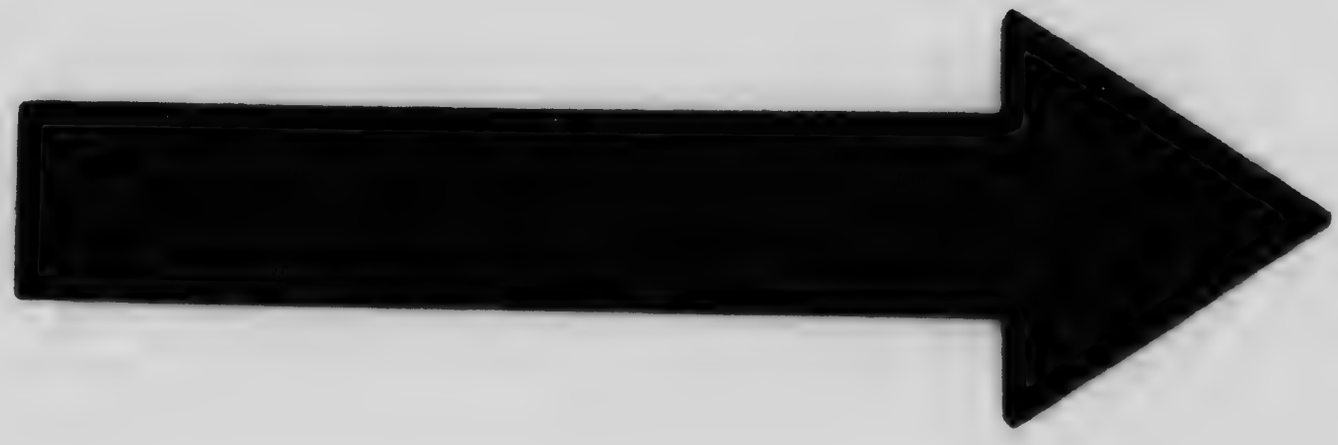
Gabion (gā'bi-un), a large wicker-work basket of cylindrical form, but without bottom. In a siege, when forming a trench, a row of gabions is placed on the outside nearest the fortress, and filled with earth as it is thrown

Part of Trench with Gabions and Fascines.

from the trench, so as to form a protection against the fire of the besieged. Each gabion is about 20 inches in diameter and 33 inches in height, but this height is usually increased by placing a row of fascines on the top after the interior has been filled up.

Gable (gā'bl), the triangular end of a house or other building, from the eaves to the top, and distinguished from a pediment by this, among things, that it has no cornices.

Gaboon (ga-bön'), THE, or M'PONGO, an estuary on the west coast of Africa, opening from the Gulf of Guinea immediately north of the equator. Several rivers discharge themselves into it. The Gaboon territory forms part of the French Congo territory. The chief tribes are the Mpongwa or Gabonese, and the Fans, who carry on an active trade with Europeans in ivory, copal, ebony, dyewoods, etc. The vast swamps render the climate unhealthy, but inland rise some considerable hills with dense



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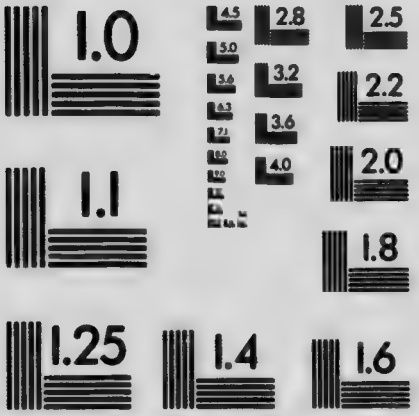

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jungle-like woods, the abode of the gorilla. The chief station is Libreville. There are several English trading-posts along the estuary (Glass Town, Olemi, etc.), and mission stations of several nations.

Gaboriau (ga-bo-rē-ō), Emile, a French novelist, born in 1834; died in Paris in 1873. After contributing to the smaller Parisian journals short sketches published under the titles *Ruses d'Amour*, *Les Comédiennes Adorées*, etc., he achieved a considerable success by his novel *Dossier No. 113* (1866). He continued to work this vein in a series of clever stories dealing with crime and its detection: *Le Crime d'Orcival*, *L'Affaire Lerouge*, *Les Esclaves de Paris*, *La Vie Infernale*, *La Corde au Cou*, *L'Argent des Autres*, etc.

Gabriel (gā'bri-el; 'hero or man of God'), according to Biblical history, the angel who announced to Zacharias the birth of John, and to Mary the birth of the Saviour. In Jewish mythology he is one of the seven archangels. The rabbins say he is the angel of death for the Israelites, and according to the Talmud he is a prince of fire, who presides over thunder and the ripening of fruits. In Mohammedan theology he is one of the four angels employed in writing the divine decrees, and the angel of revelation, in which capacity he dictated the Koran to Mohammed.

Gad (gad; 'a troop'), one of the twelve tribes of Israel, which took its name from Gad, the son of Jacob and Zillah. At the time of the exodus the tribe numbered 45,650 men of twenty years old and upwards; and as being a pastoral tribe they were assigned a rich district in Gilead between Reuben and Mannasseh. See Josh. xiii, 24-28.

Gadames. See *Ghadames*.

Gadara (gad'a-ra), an ancient city of Syria, in the Decapolis, about 6 miles S. E. of the Sea of Galilee. It played an important part in the struggles against Antiochus, Alexander Jannæus, and Vespasian, and only fell into decay after the Mohammedan conquest of Syria.

Gaddi (gad'ē). (1) Gaddo, a Florentine worker in mosaic and founder of the modern mosaic art, born 249; died 1312.—(2) Taddeo, an artist, son of preceding, born 1300; died 1360. His works are among the best examples of fourteenth-century art, his decorations of the Church of Santa Maria Novella at Florence being specially noteworthy. —(3) Agnolo, son of Taddeo, born 1324; died 1390. His style was compounded from his father and Giotto, and he has been called the founder of the Venetian school.

Gade (gā'de), Niels Wilhelm, one of the leading Scandinavian composers, born in 1817 at Copenhagen, where, in 1841, by his overture entitled *Echoes of Ossian*, he gained the prize of the Musical Union. He was supported during his studies abroad by a royal stipend, and in 1844 was appointed to succeed Mendelssohn in the direction of the Gewandhaus concerts at Leipzig. In 1850 he was appointed musical director to the King of Denmark, and in 1876 received a life pension. His works, which are Mendelssohnian in character, include seven symphonies, several overtures, sonatas, quintets, etc.; a lyrical drama —*Comala;* a religious cantata—*The Crusaders;* an opera—*The Nibelungen;* etc.

Gades, the ancient name of Cadiz.

Gadfly (gad'flī), a name commonly applied to various insects, a large number of which belong to the great Linnæan genus *Œstrus*, while others belong to the genus *Tabănus*. *Œ. bovis* or ox gadfly (the *Hypoderma bovis* of some naturalists) is about 7 lines in length; thorax yellow, with a black band; abdomen white; terminal segments fulvous; wings dusky. This species attacks the horse also, the female depositing her eggs in the skin of these animals in considerable numbers. In a short time the eggs are matured, and produce a *larva* or worm, which immediately pierces the skin, raising large lumps or tumors filled with pus, upon which the larva feeds. *Œ. equi* (the *Gastrophilus* or *Gastrus equi* of some naturalists) deposits its eggs upon such parts of the skin of horses as are subject to be much licked by the animal, and thus they are conveyed to the stomach, where the heat speedily hatches the larvæ, too well known under the name of *botts*. *Œ. ovis* (also called *Cephalomyia ovis*) deposits its eggs in the nostrils of sheep, where the larva is hatched, and immediately ascends into the frontal sinuses, attaching itself very firmly to the lining membrane by means of two strong hooks situated at its mouth. Other species infest the buffalo, camel, stag, etc. Even rhinoceroses and elephants are said not to be altogether exempt from their attacks. The characteristics of the genus *Tabănus* are two enormous eyes, usually of a greenish-yellow color rayed or spotted with purple antennæ scarcely longer than the head, the last joint with five divisions. These insects suck the blood of horned cattle, horses, and sometimes

even of men. Cattle exhibit great alarm and excitement at the presence of the gadfly, and rush wildly about, with head stretched forward and tail stuck out, to escape from their tormentor. These pests are common in the different sections of the United States.

Gadidæ (gad'i-dē), a family of malacopterous fishes, which includes the cod, ling, haddock, etc. See *Cod*.

Gadolinite (gad'o-lin-īt), a mineral, a silicate of yttrium, with considerable proportion of lime and magnesia, of the oxides of iron, cerium, lanthanum, glucinum, and of other bases.

Gadsden (gadz'den), a town, capital of Etowah County, Alabama, on the Coosa River, 63 miles N. W. of Birmingham. It has blast furnaces, carworks, cottonseed oil and saw mills, etc., and a large trade in lumber, cotton, and grain. There are iron and coal fields in its vicinity. Pop. 10,557.

Gadsden Purchase (gadz'den), a tract of land in Southern New Mexico and Arizona, acquired from Mexico in 1853 by treaty negotiated by Gen. James Gadsden. The purpose of this purchase was a proper adjustment of the southern border line of the two territories, the United States paying Mexico $10,000,000 for the new area of 45,535 square miles acquired.

Gadwall (gad'wal), the common name of *Anas strepera*, a species of duck not so large as the mallard, with long, pointed wings and a vigorous and rapid flight. North America as far down as South Carolina is its favorite habitat. It visits Europe but is rare in Great Britain.

Gaedhelic (gā'el-ik). See *Gael*.

Gaekwar, or GAIKWAR (gīk-wär'). See *Baroda*.

Gael (gāl), the name of a branch of the Celts inhabiting the Highlands of Scotland, Ireland, and the Isle of Man. Gadhel or Gael is the only name by which those who speak the Gaelic language are known to themselves. By way of distinction the Highlanders of Scotland call themselves Gael Albinnich (Gaels of Albin) and the Celtic population of Ireland call themselves Gael Erinnich (Gaels of Erin).

Gaelic, is a linguistic title now generally restricted to that dialect of the Celtic language which is spoken in the Highlands of Scotland, and hence distinguished from Manx and Irish, the other two kindred dialects, which scholars of the present day include under the name (or rather spelling) Gaedhelic. The modern Gaelic differs to some extent from the Irish in pronunciation, in grammar, in idioms, and in vocabulary. The literature of the Gaelic language is somewhat scanty, and is much less ancient and important than the Irish. The earliest written specimens of Gaelic are scraps contained in the *Book of Deer*, a religious manual belonging to the early part of the twelfth century. To the fourteenth and fifteenth centuries a considerable number of pieces belong. A collection of the older poetry, ascribed to Ossian and others, was made in the first half of the sixteenth century by Sir James Macgregor, dean of Lismore—hence called 'The Dean of Lismore's Book.' Robert Calder Mackay, or Robb Donn, and Duncan Ban McIntyre, of Glenorchy, are the two most noteworthy poets among the Scottish Highlanders in modern times. They both belong to the eighteenth century. This century also saw the publication of the Bible in Gaelic, the Irish Bible having been previously well known in the Highlands. The so-called poems of *Ossian* appeared about the same time, but in English, and it was not till 1818 that the corresponding Gaelic text appeared. A series of tales and legends of the Highlands of Scotland have been collected and published by J. F. Campbell. Various English works have been translated into Gaelic, and several collections of Gaelic poetry have been published in the present century, as well as Gaelic periodicals. Gaelic poetry still continues to be written not only in Scotland but even in America.

Gaëta (gä-ā'tä; anciently *Caieta*), a strongly fortified seaport town of S. Italy, province of Terra di Lavoro, on the Gulf of Gaëta, the seat of a bishop, 45 miles northwest of Naples. It is a place of great antiquity, was a favorite resort of the wealthy families of Rome, and since the fifth century has had a prominent place in the history of Italy, and especially in that of the Kingdom of Naples. Pop. of commune 15,528.

Gætulia (jē-tū'li-a), the ancient name of an extensive region of Africa, on the southern slope of Mount Atlas. It corresponds to the modern Biledulgerid, the southern part of Morocco, and the northern part of the Sahara. It was inhabited by warlike tribes, who are supposed to be the ancestors of the modern Tuaregs of the Sahara oases.

Gaff (gaf), a spar used in ships to extend the upper edge of fore-and-aft sails which are not set on stays. The fore-end of the gaff, where it embraces the mast, is termed the *jaw*, the outer end

the *peak*. The jaw forms a semicircle, and is secured in its position by a jaw-rope passing round the mast.

Gage (gāj), LYMAN JUDSON, banker, was born at De Ruyter, New York, in 1836. He entered the banking business in 1853, removed to Chicago in 1855 and became connected with the First National Bank of that city, of which he was made president in 1891. His reputation as a banker of great ability brought him the appointment of Secretary of the Treasury in President McKinley's cabinet in 1897. He held this position under Roosevelt until 1902, when he became president of the U. S. Trust Company of New York.

Gage, MATILDA JOSLYN, suffragist, was born at Cicero, New York, in 1826; died in 1898. She became an active advocate of woman suffrage, and was secretary and afterwards president of the New York State Society, and also president of the National Women's Suffrage Association and the Women's National Liberal Union. She wrote several works on the subject of women's rights.

Gahn (gän), JOHANN GOTTLIEB, a Swedish chemist, born in 1745; died in 1818. In his chemical work he was associated with Bergman, Scheele, and Berzelius. He left an account of the blowpipe and its application.

Gahnite (gän'īt), a name given to automolite in honor of Gahn. It is a native aluminate of zinc, crystallizes in octa- and tetra-hedrons, is of dark green or black color, and is not affected by the blowpipe flame or by acids or alkalies.

Gaillac (gä-yȧk), a town of Southern France, department of Tarn, on the right bank of the Tarn. It exports a good red table-wine, the district abounding in vineyards. Pop. 5568.

Gaillarde (gāl'li-ard; Italian, *Gagliarda*), a lively Italian dance, in triple time; also called, from its alleged origin, *Romanesque*.

Gainesville (gānz'vil), a city, capital of Alachua Co., Florida, 70 miles S. W. of Jacksonville. Market gardening is important; and it has phosphate and fertilizer industries. It is a health resort. Pop. 6183.

Gainesville, a city, capital of Hall Co., Georgia, 53 miles N. E. of Atlanta. It has mineral springs and is a summer and health resort. Its industries include cotton goods, cotton-seed oil, etc. Pop. 5925.

Gainesville (gānz'vil), a city, capital of Cooke County, Texas, near the Trinity River and 285 miles N. E. of Austin. It has cotton compresses, packing mills, ironworks, brick and broom factories, and does a good trade. Pop. 7624.

Gainsborough (gāns'bur-o), a market town of England, county of Lincoln, 15 miles north-west of the town of Lincoln, on the Trent, which is navigable by vessels of from 150 to 200 tons, and is connected with the extensive canal navigation established to Manchester, Liverpool, Gloucester, Bristol, London, etc. Among the chief buildings are the parish church, the town hall, and the old hall or manor house, containing the assembly rooms and mechanics' institute—a large quaint building, supposed to have been partly built by John of Gaunt. There are oil mills, breweries, malt houses, etc. Pop. (1911) 20,589.

Gainsborough, THOMAS, an English painter, was born at Sudbury, Suffolk, in 1727. He was trained under the engraver Gravelot and the painter Hayman, but met with small success till his marriage with Miss Burr, a lady of beauty and fortune, in 1746. After residing for some time in Ipswich and Bath, he went in 1774 to London, where he passed the rest of his life. He was one of the original thirty-six academicians. He rivaled Sir Joshua Reynolds as a portrait painter, and showed no less originality in landscape. He died in 1788.

Gains, MYRA CLARK, a celebrated litigant, born in New Orleans in 1805; died in 1885. Her father had owned a very large estate in that city, but she had first to establish the fact of her being a legitimate child of her father, and from 1832 to the time of her death she fought in the courts for her property, which had fallen into other hands. She won favorable decisions in the U. S. Supreme Court, but the costs of the long-protracted suit ate up all the proceeds and she obtained nothing.

Gaius (gā'us), or CAIUS, a Roman lawyer of the time of Adrian and Antoninus Pius, of whose life very little is known. Of his numerous works, his *Institutes* are particularly important; first, as having been for centuries, down to the time of Justinian, one of the most common manuals of law; secondly, as having been the foundation of the official compendium of the law which occupies an important place in the reform of the judicial system by Justinian; and, thirdly, as the only tolerably full, systematic, and well-arranged source of the old Roman law. The bulk of the work in MS. was discovered in 1816 by Niebuhr.

Galactodendron (gal-ak-tō-den'-dron). See *Cow-tree.*

Galactometer (gal-ak-tom'e-ter). See *Lactometer.*

Galactose (ga-lak'tōs; $C_6H_{12}O_6$), a variety of sugar produced by boiling milk-sugar or lactose ($C_{12}H_{22}O_{11}$) with dilute sulphuric acid.

Galacz. See *Galatz.*

Galago (ga-lā'go), the native name of a genus of quadrumanous mammals found in Africa. The species which are nocturnal in their habits, have long hind legs, great eyes, and large, membranous ears. The great galago (*G. crassicaudatus*) is as large as a rabbit. They live in trees, and are sought after as food in Africa.

Galanga (ga-lang'ga), or GALANGAL ROOT, a dried rhizome brought from China and used in medicine, being an aromatic stimulant of the nature of ginger. It is chiefly produced by *Alpinia officinarum*, a flag-like plant about 4 feet high, with narrow, lanceolate leaves and simple racemes of white flowers. The greater galangal is the rhizome of *A. Galanga.*

Galapagos (ga-läp'a-gos; the Spanish for 'tortoises'), a group of thirteen islands of volcanic origin in the North Pacific Ocean, about 600 miles west of the coast of Ecuador, to which they belong; area, 2950 square miles. The most important is Albemarle, 60 miles long by 15 broad, and rising 4700 feet above the sea. Others are Indefatigable, Chatham, Charles, James, and Narborough. Of these, some are used by the Republic of Ecuador as penal settlements. Many of the fauna and flora of the islands are peculiar to them, the most remarkable being a large lizard and the elephant tortoise.

Galashiels (gal-a-shēlz'), a town in Scotland, on both sides of the Gala, about a mile above its confluence with the Tweed, 27 miles S. S. E. of Edinburgh. It is noted for its manufactures of tweeds, plaids, shawls, woolen yarns, etc. Pop. 13,952.

Galatea (gal-a-tē'a), in classic mythology, the daughter of Nereus and Doris, who rejected the suit of the Cyclops Polyphemus and gave herself to the Sicilian shepherd Acis. The monster, having surprised them, crushed Acis beneath a rock.

Galatia (ga-lā'sha), the ancient name of an extensive region in Asia Minor, so-called from its Gallic inhabitants, who in the first place formed part of the invading hordes of Gauls under Brennus in the third century B. C. These were compelled by Attalus, king of Pergamos, to settle within well-defined limits between Paphlagonia, Pontus, Cappadocia, Lycaonia, Phrygia, and Bithynia. With the Gauls were intermingled a considerable proportion of Greeks; hence the inhabitants were often called Gallo-græci, as well as Galatians.

Galatians (ga-lā'shans), EPISTLE TO THE, one of the most important epistles of St. Paul, written probably about 56 A.D., soon after his second visit to Galatia, recorded in Acts, xviii, 23. It was directed against the spread of Judaistic practices in the Galatian churches and especially against the practice of circumcision. It has been the subject of numerous commentaries by Luther, Winer, Meyer, Ellicott, Alford, and others.

Galatina (gä-la-tē'na), SAN PIETRO IN, a town of South Italy, in the province of Lecce and 16 miles west of Otranto. Pop. about 11,000.

Galatz (gä'lats), or GALACZ, a town and port in Roumania, in Moldavia, on the left bank of the Danube, between the confluence of the Sereth and Pruth. It consists of an old and a new town, the latter on a hill dominating the river and commanding a fine view of the Balkans. The harbor, accessible to vessels drawing 15 feet, is well frequented, and an emporium of trade between Austria, Russia, and Constantinople. The trade was formerly entirely in the hands of the Greeks, but now many English and other foreign houses have established themselves. The chief exports are grain (principally maize), wine, planks and deals, tallow, etc. The imports are chiefly British manufactures, sugar, tin plates, iron and steel, coal, oil, fruits, tobacco, fish, glassware, leather, coarse cloth. When made a free port in 1834 it had only 8000 inhabitants, but the population has since grown to over 60,000. It ceased to be a free port in 1883.

Galaxy (gal'ak-si; *Via Lactea*, or Milky Way), in astronomy, that long luminous track which is seen at night stretching across the heavens from horizon to horizon, and which, when fully traced, is found to encompass the heavenly sphere like a girdle. This luminous appearance is occasioned by a multitude of stars so distant and blended as to be distinguishable only by the most powerful telescopes. At one part of its course it divides into two great branches, which remain apart for a distance of 150° and then reunite; many other smaller branches are given off. At one point it

spreads out very widely, exhibiting a fan-like expanse of interlacing branches nearly 20° broad; this terminates abruptly and leaves here a kind of gap. At several points are seen dark spots in the midst of some of the brightest portions; one of the most easily distinguished of these dark spots has long been known as the 'coal sack.' According to Herschel's hypothesis, our sun and planetary system form part of the Milky Way.

Galba (gal'ba), SERVIUS SULPIUS, a Roman emperor, successor of Nero, born B.C. 3. He was made prætor (A.D. 20), and afterwards governor of Aquitania, and in A.D. 33 was raised to the consulship through the influence of Livia Drusilla, the wife of Augustus. Caligula appointed him general in Germany, and Claudius sent him in A.D. 45 as pro-consul to Africa, his services there obtaining him the honors of a triumph. He then lived in retirement till the middle of Nero's reign, when the emperor appointed him governor of Hispania Tarraconensis, but soon after ordered him to be secretly assassinated. Galba revolted; the death of Nero followed (A.D. 68), and he himself was chosen emperor by the prætorian cohorts in Rome. He went directly to Rome, but soon made himself unpopular by cruelty and avarice, and he was slain in the forum in A.D. 69 at the age of seventy-two.

Galbanum (gal'ba-num), GALBAN, a fetid gum resin procured from at least two species of umbelliferous plants, which are probably *Ferŭla galbaniflŭa* and *F. rubricaulis*. It consists of the 'tears' of gum resin which exude spontaneously from the stem, especially in its lower part and about the bases of the leaves. It is brought from the Levant, Persia, and India, and is administered internally as a stimulating expectorant. It is also used in the arts, as in the manufacture of varnish. It is supposed to be yielded by other umbellifers, among which are named *Ferulāgo galbanifĕra*, *Opoidia galbanifĕra*, and *Bubon Galbanum*.

Galbulinæ (gal-bu-lī'nē), the jacamars, a family of tropical American fissirostral birds allied to the trogons and kingfishers.

Gale (gāl), a plant of the genus *Myrica*, nat. order Myricaceæ. Sweet gale or bog-myrtle (*M. Gale*) is a shrub from 1 to 3 feet high, which exhales a rather pleasant aromatic odor, and grows on wet heaths abundantly. In America the name is applied to an allied plant *Comptonia asplenifolia*. See also *Candleberry*.

Galeidæ (ga-lē'i-dē), the topes, a family of small sharks. Two species, the common tope (*Galeus canis*) and the smooth hound (*Mustēlus vulgāris*), are abundant in British seas.

Galemys (ga-lē'mis), a genus of mammals allied to the shrews. Only two species are known, the Russian desman or muskrat (*G. moschata*) and the French desman (*G. pyrenaica*). They live in burrows at the side of streams, and feed on insects. See *Musk-rat*.

Galen (gā'len), properly CLAUDIUS GALENUS, a Greek physician, born A.D. 130, at Pergamus in Asia Minor. His father, Nicon, an architect and mathematician, gave him a careful education, and he studied under physicians in Smyrna, Corinth, Alexandria, etc., afterwards visiting Cilicia, Phœnicia, and Palestine. He returned in 103 to Pergamus, where he received a public appointment, but five years later went to Rome, and there acquired great celebrity by his cures. Driven thence by envy, he again traveled for some time and resumed his labors in his native town, but was soon after invited to Aquileia by the Emperors Marcus Aurelius and Lucius Verus (A.D. 169). He followed Marcus Aurelius to Rome, and appears to have remained there for some years before finally retiring to Pergamus. The closing part of his life, however, is obscure. One Arabic writer says that he died in Sicily, and Suidas states that he died at the age of seventy, and accordingly in the year A.D. 200 or 201; but it is not improbable that he lived longer. The writings attributed to Galen include eighty-three treatises acknowledged to be genuine; forty-five manifestly spurious; nineteen of doubtful genuineness, and fifteen commentaries on different works of Hippocrates, besides a large number of short pieces and fragments, probably in great part spurious. The most valuable of his works were those dealing with anatomy and physiology, and he was the first to establish the value of the pulse in diagnosis and prognosis. Till the middle of the sixteenth century his authority in medicine was supreme.

Galena (ga-lē'na; PbS), the sulphide of lead, found both in masses and crystallized in cubes, but sometimes in truncated octahedra; its color is bluish gray, like lead, but brighter; luster metallic; texture foliated; fragments cubical; soft, but brittle; specific gravity, 7.22 to 7.759; effervesces with nitric and hydrochloric acids. For the most part, it contains about 86.6 per cent. of lead and 13.4 of

sulphur, generally some silver, and also antimony, zinc, iron, and bismuth. Where the proportion of silver is high it is known as *argentiferous galena*, and worked with a view to the extraction of this metal. Galena occurs principally in the older or primary rocks, being found in England mainly in the Mountain Limestone (base of the Carboniferous formation). In the United States it is very abundant, the deposit of galena in which the mines of Illinois are situated being the most extensive and important hitherto discovered. The town of Galena (of less than 5000 population) is named from it.

Galena, a city of Cherokee County, Kansas, 19 miles S. E. of Columbus. Here lead and zinc are largely mined and smelted and there are large stamping and smelting works. Pop. 6096.

Galenists (gā'lin-ists), the name of the body of controversialists who, appealing to the authority of Galen, opposed the introduction of chemical and alchemical methods of treatment into medicine. They adhered to the ancient formulas, which prescribed preparations of herbs and roots by infusion, decoction, etc., while the chemists professed to extract essences and quintessences by calcination, digestion, fermentation, etc. Neither body possessed a monopoly of the truth, and modern medicine combines the better elements in each method.

Galeopithecus (ga-le-o-pi-thē'-kus). See *Flying-lemur.*

Galeopsis (ga-le-op'sis), the generic name of the hemp-nettles, a genus of plants, of the nat. order Labiatæ. The best species is *G. versicolor*, which has showy, yellow flowers with a purple spot on each.

Galerie des Glaces (gȧ-le-rē' dė glȧs), or HALL OF MIRRORS, a historic room in the Palace of Versailles, so called from the splendid mirrors which adorn the walls. In 1871, William I was proclaimed German emperor here. Here the treaty of peace, ending the European war, was signed, June 28, 1919. (See *Treaty.*)

Galerius (ga-le'ri-us), a Roman emperor. See *Maximianus.*

Galesburg (gālz'burg), a city, county seat of Knox county, Illinois, 163 miles S. W. of Chicago, in a fertile farming country. It has railroad shops, iron foundries and manufactures of various kinds. Coal is abundant in its vicinity. Knox and Lombard Colleges are situated here. Pop. 24,064.

Galicia (gal-ish'e-a), prior to 1919, a crownland of Austria, bounded by Russia, Bukowina, Hungary, and Moravia; area, 30,312 square miles; pop. (Polish in the west, Russniak in the east) 7,315,810. The great physical features of the country are, in a manner, determined by the Carpathians, which form a long and irregular curve on the south, and send out branches into Galicia. Farther to the north the hills subside rapidly, and finally merge into vast plains. It has several considerable rivers, those on the west being affluents of the Vistula, those in the east, of the Danube and the Dniester. The climate is severe, particularly in the south, where more than one of the Carpathian summits rise beyond the snow-line. The summers are very warm but comparatively short. The soil in general is fertile, and yields abundant crops of cereals, hemp, flax, tobacco, etc. The domestic animals include great numbers of horned cattle, and a fine hardy breed of horses. Sheep are in general neglected; but goats, swine, and poultry abound, and bee-keeping is practiced on a large scale. Bears and wolves are still found in the forests; and all the lesser kinds of game are in abundance. The minerals include marble, alabaster, copper, calamine, coal, iron, and rock-salt. Only the last two are of much importance. Rock-salt is particularly abundant. The most important mines have their central locality at Wieliczka. Manufactures have not made much progress. The spinning and weaving of flax and hemp prevail to a considerable extent on the confines of Silesia. Distilleries exist in every quarter. The Roman Catholics and the Greek Catholics are the chief religious bodies. The chief educational establishments are the University of Lemberg and that of Cracow. The principal towns are Lemberg, the capital, and Cracow. After being the field of continuous strife between Russians, Poles, and Hungarians, Galicia continued a Polish dependency from 1382 until the first partition of Poland, in 1772, when it was acquired by Austria. In the war of 1914-18 (see *European War*), it was the scene of severe fighting between the Russians and the Central Powers. By the peace of 1919 (see *Treaty*), Austria was reduced to a small state, the great Austro-Hungarian empire was dismembered and Galicia passed under the control of the reconstructed state of Poland.

Galicia, one of the old provinces of Spain, situated in the N. W., and bounded N. and W. by the Atlantic, S. by Portugal, and E. by the old provinces of Asturias and Leon. It is now divided into the provinces of Coruña, Lugo, Orense, and Pontevedra; area,

11,212 square miles. Its broken coast, which has a length of about 240 miles, lies open to the Atlantic, and there are a number of fine natural harbors, of which Ferrol is one of the finest naval ports in Europe. The surface is mountainous, and the proportion of good arable land limited; but fruit, particularly apples and pears, nuts, walnuts, and chestnuts, is abundant; and the culture of the vine is common in all the lower districts. The higher mountain slopes are generally covered with fine forests, which feed large herds of swine, and afford haunts to boars and wolves. Both manufactures and trade are insignificant. The chief town is Santiago de Compostella. The natives (Gallegos) speak an uncouth patois, which other Spaniards scarcely understand. The peasantry are very poor, and many leave for service in other parts of Spain. Pop. 1,941,453.

Galilee (gal'i-lē), in the time of Jesus Christ the most northern province of Palestine, bounded on the E. by the river Jordan, on the S. by Samaria, on the W. by the Mediterranean Sea and Phœnicia, and on the N. by Syria and the Mountains of Lebanon. It was in some sense the cradle of Christianity, its towns of Nazareth, Cana, Capernaum, Nain, and other places being intimately associated with the life of Christ. The inhabitants of this country, mostly poor fishermen, on account of their ignorance and simplicity of manners were despised by the Jews, who, by way of contempt, called Christians, at first, *Galileans*. At present Galilee is included in the vilayet of Syria.

Galilee, a portico or chapel annexed to a church, used for various purposes. In it public penitents were stationed, dead bodies deposited previously to their interment, and religious processions formed; and it was only in the galilee that in certain religious houses the female relatives of the monks were allowed to converse with them, or even to attend divine service. The only English buildings to which the term galilee is applied are attached to the cathedrals of Durham, Ely, and Lincoln.

Galilee, SEA OF, also called Sea of Chinnereth or Chinneroth, and the Lake of Gennesaret or Tiberias, a pear-shaped fresh water lake in Central Palestine, 12½ miles long by 7½ broad. It was apparently formed by subsidence attended with volcanic disturbance; and is 682 feet below the level of the Mediterranean. On the east the coasts are nearly 2000 feet high, deeply furrowed by ravines, but flat along the summit. The whole basin is bleak and monotonous, and has a scathed volcanic look, the cliffs and rocks along the shore being of hard porous basalt. At the time of Christ there were on its shores nine flourishing cities, of which seven are now uninhabited ruins, while Magdala and Tiberias are both in a poverty-stricken condition. The lake still abounds in fish, but the fishery is neglected.

Galilei (gal-i-lā'ē), GALILEO, a most distinguished Italian physicist, born 18th Feb., 1564, at Pisa. His father, Vincenzo Galilei, a nobleman of Florence, procured him an excellent education in literature and the arts, and in 1581 he entered the University of Pisa. At nineteen the swinging of a lamp in Pisa cathedral led him to investigate the laws of the oscillation of the pendulum, which he subsequently applied in the measurement of time; and in 1586 the works of Archimedes suggested his invention of the hydrostatic balance. He now devoted his attention exclusively to mathematics and natural science, and in 1589 was made professor of mathematics in the University of Pisa. In 1592 he was appointed professor of mathematics in Padua, where he continued eighteen years, and his lectures acquired European fame. Here he made the important discovery that the spaces through which a body falls, in equal times, increase as the numbers 1, 3, 5, 7. He improved the thermometer, and made some interesting observations on the magnet. To the telescope, which in Holland remained not only imperfect but useless, he gave astronomical importance. He noted the irregularity of the moon's surface, and taught his scholars to measure the height of its mountains by their shadow. A particular nebula he resolved into individual stars, and conjectured that the Milky Way might be resolved in the same manner. His most remarkable discovery was that of Jupiter's satellites (1310), and he observed, though imperfectly, the ring of Saturn. He also detected the sun's spots, and inferred, from their regular advance from east to west, the rotation of the sun, and the inclination of its axis to the plane of the ecliptic. In 1610 Cosmo II, grand-duke of Tuscany, appointed him grand-ducal mathematician and philosopher, and with increased leisure he lived sometimes in Florence, and sometimes at the country seat of his friend Salviata, where he gained a decisive victory for the Copernican system by the discovery of the varying phases of Mercury, Venus, and Mars. In 1611 he visited Rome for the first time, where he was honorably received; but on

his return to Florence he became more and more involved in controversy, which gradually took a theological turn. The monks preached against him, and in 1616 he found himself again obliged to proceed to Rome, where he is doubtfully said to have pledged himself to abstain from promulgating his astronomical views. In 1623 Galileo replied to an attack upon him in his *Saggiatore*, a masterpiece of eloquence, which drew upon him the fury of the Jesuits. In 1632, with the permission of the pope, he published a dialogue expounding the Copernican system as against the Ptolemaic. A congregation of cardinals, monks, and mathematicians, all sworn enemies of Galileo, examined his work, condemned it as highly dangerous, and summoned him before the tribunal of the Inquisition. The veteran philosopher was compelled to go to Rome early in 1633, and was condemned to renounce upon his knees the truths he had maintained. At the moment when he arose, he is said (but this is doubtful) to have exclaimed, in an undertone, stamping his foot, 'E pur si muove!' (and yet it moves!). Upon this he was sentenced to the dungeons of the Inquisition for an indefinite time, and every week, for three years, was to repeat the seven penitential psalms of David. After a few days' detention his sentence of imprisonment was commuted to banishment to the villa of the Grand-duke of Tuscany at Rome, and then to the archiepiscopal palace at Sienna. He was afterwards allowed to return to his residence at Arcetri, near Florence, where he employed his last years principally in the study of mechanics and projectiles. The results are found in two important works on the laws of motion, the foundation of the present system of physics and astronomy. At the same time he tried to make use of Jupiter's satellites for the calculation of longitudes; and though he brought nothing to perfection in this branch, he was the first who reflected systematically on such a method of fixing geographical longitudes. He was at this time afflicted with a disease in his eyes, one of which was wholly blind and the other almost useless, when, in 1637, he discovered the libration of the moon. Domestic troubles and disease embittered the last years of Galileo's life. He died in 1642 (the year Newton was born). His remains were ultimately deposited in the church of Sta. Croce, at Florence.

Galingale (gal'in-gāl), a name applied to a kind of sedge, the *Cupĕrus longus*, or to its tubers, which contain a bitter principle, and have tonic and stomachic properties.

Galion (gal'i-on), a city of Crawford County, Ohio, 15 miles W. by S. of Mansfield. It has machine and railroad shops, road machinery, pipe, telephone and other factories, brass foundry, brick and tile works, etc. Pop. 8175.

Galipot (gal'i-pot), or FRENCH TURPENTINE, the long, soft stalactitic pieces of resin which form down the sides of the *Pinus maritima*.

Gall (gal), in the animal economy. See *Gall-bladder, Bile.*

Gall, FRANZ JOSEPH, the founder of phrenology, born in 1758 in Tiefenbrunn, in Baden; died in 1828. He studied medicine, and practiced at Vienna as a physician, where he made himself known to advantage by his *Philosophisch-medicinische Untersuchungen* (1791). After a series of comparisons of the skulls both of men and animals he was led to assign the particular location of twenty organs. For some time he confined himself to lecturing on the subject, first in Vienna, and afterwards in his travels through Germany. He then accompanied Dr. Spurzheim, in 1807, to Paris, where he published with his friend, in 1810, the *Anatomie et Physiologie du Système Nerveux en général, et du Cerveau en particulier;* and in 1812 his own *Des Dispositions innées de l'Ame et de l'Esprit, ou du Matérialisme.* Spurzheim also published, in London, a work upon his own and Gall's theories, which met with severe criticism but extended their views, and at least gave an impulse to the accurate anatomical study of the brain.

Gall, ST. (German, *St. Gallen*), a northeastern frontier canton in Switzerland, abutting on Lake Constance; partly bounded by the Rhine, and enclosing the canton of Appenzell. Its area is 780 square miles. In the south it is one of the loftiest Alpine districts of Switzerland, and in other quarters is more or less mountainous. It belongs wholly to the basin of the Rhine, in the valley of which the climate is comparatively mild; in the mountainous districts it is very rigorous. Wood and good pasture are found on the mountains; on the lower slopes and valleys, vines and orchard fruits, and corn, maize, hemp, and flax are grown. The manufactures are chiefly cotton and linen goods, particularly fine muslins. The constitution is one of the most democratic in Switzerland. German is the language spoken. Pop. 250,285.—ST. GALL, the capital and the see of a bishop, is situated on the Steinach, 2165 feet above sea-level. It contains an old cathedral, now completely modernized, and an old abbey partly converted into public offices, but containing

also the bishop's residence and episcopal library with valuable manuscripts. The manufactures consist chiefly of cotton goods, more especially embroidered muslins and prints; and the town is the entrepôt both for its own canton and those of Appenzell and Thurgau. It is of ancient origin, having grown up around the abbey of St. Gall, founded by an Irish monk of that name about the beginning of the seventh century. This abbey for several centuries held one of the highest places in the Benedictine order. Pop. (1910) 37,106.

Gallait (gȧl-lā), LOUIS, a Belgian historical painter, born in 1812; died in 1887. He studied at his native town Tournai, Antwerp and Paris, where he acquired a name by his portraits as well as his genre and historical paintings. Among his earlier pictures of note were: *Christ Restoring Sight to a Blind Man; The Strolling Musicians; The Beggars; Montaigne Visiting Tasso in Prison; Abdication of Charles V.* He produced many later pictures, the last of which, *The Plague at Tournay* (1882), was purchased for the Brussels Museum at the price of 120,000 francs.

Galland (gȧl-ăn), ANTOINE, a French oriental scholar, born in Picardy in 1646; principally known for his translation of the *Arabian Nights' Entertainments* (1704-1717). the first into any European language. Among his other writings are a *Treatise on Medals and Coins; Tableau de l'Empire Ottoman; De l'Origine du Café; Paroles remarquables, Bons Mots et Maximes des Orientaux*, and the *Contes et Fables Indiennes de Bidpaï et de Lokman.* In 1709 he was appointed professor of Arabic at the Collège Royal at Paris, and died in 1715 while engaged in translating the Koran.

Galla Ox, or SANGA, a remarkable variety of ox inhabiting Abyssinia. The chief peculiarity is the extraordinary size of the horns, which rise from the forehead with an outward and then an inward curve, producing an exact figure of a lyre, and finally curve a little outward and taper to the top.

Gallas (gal'las), a numerous and powerful race, chiefly inhabiting a territory in East Africa, lying to the south of Abyssinia. Their color varies from a deep black to a brownish-yellow; stature tall; bodies spare, wiry, and muscular; nose often straight, or even arched; lips moderate; hair often hanging over the neck in long, twisted plaits. They have agreeable countenances, and are brave, but ferocious and cruel, cunning and faithless. They leave the plains to their horses, sheep, and cows, while they themselves cultivate the mountains. They number 6 or 8,000,000.

Gallatin (gal'la-tin), ALBERT, statesman, was born in Geneva, Switzerland, in 1761. He was graduated at the University of Geneva in 1779 and emigrated to America in 1780. In 1789 he was a member of the Pennsylvania State Convention, in 1793 was elected United States Senator, and in 1794 helped to suppress the 'Whiskey Insurrection.' In 1801 he was appointed Secretary of the Treasury, his management of which was eminently successful. In 1814 he was one of the Commissioners at Ghent who concluded the treaty of peace with Great Britain, in 1815 was appointed Minister to France, and in 1826 was envoy extraordinary to Great Britain. He died in 1849.

Gall-bladder (gal-blad'der), a small vessel embedded in the liver and containing gall. See *Bile.*

Galle (gal), or POINT DE GALLE, a fortified seaport of Ceylon, with a good harbor, formerly important as a coaling station. Pop. 37,326.

Galleon (gal'le-on), formerly a kind of vessel of war, used by the Spaniards and Portuguese, with from three to four decks. In more recent times those vessels were called *galleons* in which the Spaniards transported treasure from their American colonies.

Gallery (gal'er-i), in architecture, a long, narrow room, the length of which is at least three times its width, often built to receive a collection of pictures. Among the most renowned European art-galleries are those of the Louvre at Paris, that of Versailles, the National Gallery in London, the Pitti and Uffizi galleries at Florence, the Dresden Gallery, the Real Museo of the Prado at Madrid, the Hermitage at St. Petersburg, the gallery of Berlin, the gallery of the Museo Borbonico at Naples, those at Venice, Antwerp, Turin, etc. The term gallery is also sometimes applied to what is more properly termed a corridor, likewise to a platform projecting from the walls of a building supported by piers, pillars, brackets, or consoles, and in churches, theaters, and similar buildings, to the upper floors going round the building next the wall.

Galley (gal'i), a low, flat-built vessel with one deck, and navigated with sails and oars, once commonly used in the Mediterranean. The common galley varied from 100 to 200 feet in length, those of smaller sizes being known respectively as half-galleys and

quarter-galleys. They carried as many as twenty oars on each side, each oar worked by one or more men, and they had commonly two masts with lateen sails. Raised structures in the stern, and even in the prow, were uncommon. These, however, were more fully developed in the kind of galley known as the *galleass*, which carried three masts, from 200 to 300 rowers, and sometimes twenty guns. France formerly had a number of galleys for service in the Mediterranean, in which convicts were forced to labor. The term galley is also applied to the ships of the ancient Greeks and Romans, especially to their warships, which were propelled chiefly by oars.

Galley. See *Printing*.

Galley-slave, a person condemned to work at the oar on board a galley, being chained to the deck. This mode of punishment was common in France previous to 1748.

Gallfly (gal-fli), a name for several hymenopterous insects of the family Cynipidæ, which form the morbid products known as galls, each species seeming to be addicted to a particular plant and a particular part of the plant. The tumor or gall is due to the morbid action of an irritating fluid deposited with the egg of the insect. The large galls at the base of oak leaves are produced by the *Cynips quercus baccārum*, a fly of a brown color, with black antennæ, chestnut-brown legs, and white wings. The small galls on the under surface of oak leaves are due to another species, *C. quercus folii*, those on the stems of oaks to *C. terminālis*. The shrubby oak (*Quercus infectoria*) of Syria is attacked by *C. gallæ tinctoriæ*, which gives rise to the hard gall or gallnut, which is chiefly used in commerce. The hairy gall of the rose, called a *bedeguar*, is also the work of a species of *Cynips*. The larvæ in this, as in the oak gall, do not come out till the following spring. See *Galls*.

Gallia. See *Gaul*.

Galliard (gal'yard), the name of a lively dance, similar to the *Romanesca*, a favorite Italian dance. The air is quick and lively, with a flowing melody. The word is due to the Spanish *gallarda*. Many galliard tunes are still extant, such as *The King of Denmark's Galliard*, *The Earl of Essex's Galliard*, etc. See *Gaillarde*.

Gallic Acid (gal'ik) ($C_7H_6O_5$), an acid which derives its name from the gallnut, whence it was first procured by Scheele in 1786. It exists ready formed in the seeds of the mango, has been found besides in many other plants, in acorns, colchicum, divi-divi, hellebore root, sumach, tea, walnuts, etc., and is a product of the decomposition of tannic acid. It crystallises in brilliant prisms, generally of a pale-yellow color. It colors the persalts of iron of a deep bluish black. It is of extensive use in the art of dyeing, as it constitutes one of the principal ingredients in all the shades of black, and is employed to fix or improve several other colors. It is well known as an ingredient in ink. See *Ink*.

Gallican Church (gal'i-kan), a distinctive name applied to the Roman Catholic Church in France. The peculiarity of this church consists (or consisted) not in any diversity of doctrine or practice from those generally held and observed by Roman Catholics in other countries, but in maintaining a greater degree of independence of the papal see, more especially by denying the validity of many of the decretals issued since the time of Charlemagne, and refusing to allow the pope to interfere with the civil jurisdiction of the state and the sovereign rights of the crown. The freedom asserted in this respect was increasingly recognized by the pragmatic sanctions of 1269 and 1438, and was still more clearly established by the *Quatuor Propositiones Cleri Gallicani* ('Four Propositions of the French Clergy'), drawn up in convocations by the French clergy in 1682. These were:—1. The pope in secular matters has no power over princes and kings, and cannot loose their subjects from allegiance to them. 2. He is subject to the decrees of a general council. 3. His authority in France is regulated by fixed canons and the laws and customs of the kingdom and church. 4. In matters of faith his decision is not unalterable (*irreformable*). During the revolution the Gallican Church practically disappeared, and though Napoleon extorted from Pius VII a concordat for its re-establishment, no agreement was arrived at as to its organization. With the return of the Bourbons the bishops deprived by Napoleon were restored, and a new concordat concluded in 1817; but its unpopularity led the government to exact from ecclesiastics an expression of adherence to the articles of 1682. The July revolution in 1830 gave full freedom to all denominations, and a clause was inserted in the Constitutional Charter expressly declaring that each person professes his religion with equal liberty, and obtains for his worship the same protection. Later, and especially since the Vatican

Council of 1870, the position of the Gallican Church towards the popes has essentially changed, and the older Gallicanism may now be said to be represented by the Old Catholics of France.

Gallienus (gal-li-ē'nus), P. LICINIUS, a Roman emperor, associated with his father Valerianus until the capture of the latter by the Persians in 260, when Gallienus continued to reign alone. His empire was limited by the revolt of most of the legions in the provinces, who chose their commanders as Cæsars, and thus gave rise to the period known as the 'Time of the Thirty Tyrants.' Though given up to pleasure, he defeated the Goths in Thrace and Postumus in Gaul, and forced Aureolus, whom the legions of Illyria had proclaimed emperor, to take refuge in Milan. While making preparations to reduce that town he himself was assassinated A.D. 268.

Gallifet (gâl-li-fet), GASTON AUGUSTE, MARQUIS DE, a French soldier, born at Paris in 1831. Entering the army, he was made general of brigade in 1870, subdued the revolting tribes of Africa 1872-3, and later was made general of division, and received the military medal for his brilliant handling of the army maneuvers in 1891. He retired in 1894, and was minister of war 1899-1900.

Gallinaceous Birds (gal-i-nā'shus), the order of birds now commonly known as *Rasores*.

Gall-insects. See *Gallfly*.

Gallinule (gal'i-nūl), a name for aquatic birds belonging to the family Rallidæ or rails, genera *Gallinula* and *Porphyrio*. They are good swimmers, though they are not web-footed, but have the toes furnished with a narrow membrane. The common gallinule, moor-hen or water-hen (*G. chlorŏpus*), is the only British species. It is black, with a red frontal shield.

Galliot (gal'i-ot), a Dutch or Flemish vessel for cargoes, with very rounded ribs and flattish bottom, with a mizzenmast placed near the stern, carrying a square mainsail and maintopsail, a forestay to the mainmast (there being no foremast), with fore sail and jibs.

Gallipoli (gal-ip'o-lē; ancient *Callipolis*), a seaport of Southern Italy, in the province of Lecce, on a rocky peninsula in the Gulf of Taranto, 47 miles southeast of Taranto. It is fortified, and has a cathedral, a productive tunny fishery, and a good harbor, from which large quantities of olive-oil are exported. Pop. of commune 13,352.

Gallipoli (ancient *Callipoli*), a town in European Turkey on a peninsula of the same name at the northeast end of the Dardanelles, 128 miles W. S. W. of Constantinople. It was once fortified, but is now in a generally dilapidated condition, with no edifice of note except the bazaars. It was the gate by which the Turks entered Europe (1357), and in the Crimean war the allied forces landed here (1854). During the European war (q. v.), 1914-18, a British squadron under Vice-Admiral Sackville Carden, with the co-operation of the French, attacked the forts on the peninsula, February 19, 1915, and continued the bombardment for several days, during which the outer forts were destroyed. Owing to illness, Admiral Carden was invalided home, and Admiral de Roebeck took command and made a determined attack on March 18. Mines released by the Turks inflicted considerable damage on the attacking squadron. Meantime an expeditionary force was being gathered, composed mainly of Australian and New Zealand troops, styled 'Anzacs' from the initials of Australia and New Zealand Army Corps. This force under Sir Ian Hamilton (q. v.) was landed successfully on the peninsula later in 1915 and fought with great heroism, but it became evident that, with the meager supplies at hand, they could not hope to win through the Dardanelles, and the troops were withdrawn in December and January. The British losses reached the total of 112,921.

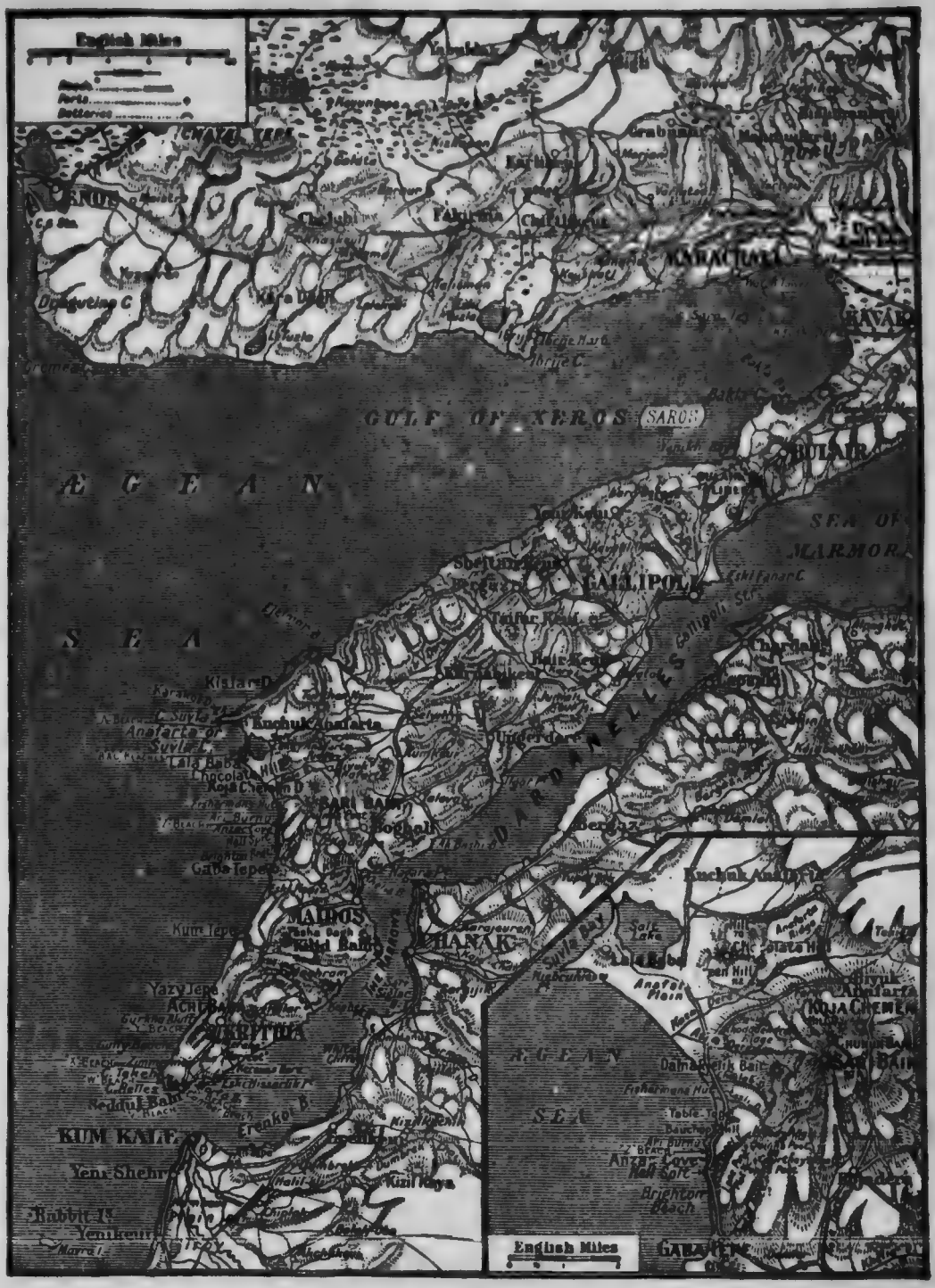
Gallipoli Oil, a coarse olive-oil used in Turkey-red dyeing and for other purposes, and prepared from olives grown in Calabria and Apulia, the latter being considered the best. The oil is conveyed in skins to Gallipoli, where it is clarified and shipped.

Gallipolis (gal-le-po-lēs'), a city, seat of Gallia county, Ohio, on the Ohio river. It has furniture factories, foundries, flour mills, and the Ohio Hospital for Epileptics. Pop. 5560.

Gallium (gal'li-um), a rare malleable metal, discovered by spectrum analysis in 1875 by De Boisbaudran in the zinc-blende of Pierrefitte in the Pyrenees. It is of a grayish-white color, has a brilliant luster, and is fused by the mere warmth of the hand. In its properties it is related to aluminum.

Galliwasp (gal'i-wâsp), the *Celestus occiduus*, a species of lizard about 1 foot in length, and remarkably stout and plump. Its general color is brown. It is a native of the West Indies, and is particularly common in Jamaica, where it is much dreaded, though without reason.

Gallnuts (gal'nuts), See *Galls*.



MAP OF THE GALLIPOLI PENINSULA

Gallon, a measure of capacity containing four quarts. Various gallons seem to have been formerly used, but in 1689 in Great Britain the wine gallon was declared by law to contain 231 cubic inches, and this is the present standard in the U. S. for liquids and represents the volume of 8.33888 lbs. avoirdupois of pure water at 39.2° F. The U. S. dry gallon is 268.8025 cubic inches or 1.16365 liquid gallons. The British imperial gallon now in use contains 10 lbs. avoirdupois of distilled water, or 277.274 cubic inches.

Galloway (gal'ō-wā), a district in the southwest of Scotland, now regarded as embracing Wigtownshire and Kirkcudbright. It has given name to a breed of horses and one of cattle.

Galls (gals), gallnuts or nutgalls, a vegetable excrescence produced by the deposit of the egg of an insect in the bark or leaves of a plant. The galls of commerce are produced by a species of *Cynips* (see *Gallfly*) in the tender shoots of the *Quercus infectoria*, a species of oak abundant in Asia Minor, Syria, Persia, etc. They are spherical and tubercular, and vary in magnitude from the size of a pea to that of a hazelnut. White, green, and blue varieties are recognized, the latter kinds being the best. They are inodorous, but are strongly astringent from the tannin and gallic acid which they contain, and which are their chief products. Gallnuts are extensively used in dyeing and in the manufacture of ink, and they are also frequently used in medicine. They are chiefly imported from Aleppo, Tripoli, and Smyrna. The Chinese galls, or *woo-pei-tsze*, differ from the foregoing in that they are really an unusually massive kind of crust or cocoon, such as the aphides form on the surface of a plant; the tissues of the plant not being affected.

Gall-stones, or BILIARY CALCULI, pathological concretions derived from the bile, causing the condition known as cholelithiasis. They may be small and numerous, many hundreds of them being sometimes contained in a distended gall-bladder; or large, sometimes over five inches in length; and sometimes they occur in the form of a gritty sand. In the majority of cases they produce no symptoms, but when they become impacted in the cystic or common bile duct, acute symptoms of biliary colic general supervene. The attack is usually sudden and marked by agonizing pain, vomiting, high temperature, etc. It rarely lasts more than a few days, but as gall-stones seldom occur singly, there is danger of a subsequent attack. The pain is said to be the most severe of all forms of suffering.

Galsworthy (gals'wėr-thi), JOHN, a British novelist and playwright, born in 1867. His novels include *The Country House*, 1907; *A Commentary*, 1908; *Fraternity*, 1909; *A Motley*, 1910; *The Patrician*, 1911; and his plays, *The Silver Box*, 1906; *Joy*, 1907; *Stife*, 1909; *Justice*, 1910; *The Little Dream*, 1911.

Galt (galt), a town of Waterloo Co., Ontario, on Grand River, 25 miles N. N. W. of Hamilton. Pop. 10,299.

Galt (galt), SIR ALEXANDER TILLOCH, a Canadian statesman, was born in London, England, in 1817; died in 1893. In 1849, he was elected a member of Parliament, and became active in public affairs, filling many important offices. He was a fluent speaker and an able minister of finance.

Galt, JOHN, a Scottish novelist, born at Irvine in Ayrshire in 1779. He went to London in 1804, printed an epic, and tried both commerce and law; but failing in each, went abroad. On his return he published his *Voyages and Travels*, his *Letters from the Levant*, a *Life of Cardinal Wolsey*, and a volume of tragedies. He became a contributor to periodicals, and fiction writer. His *Ayrshire Legatees* (1820), with its humorous descriptions of Scottish middle and low life indicated the true scope of his faculty, and it was followed by his *Annals of the Parish* (1821), *The Provost* (1822), *Sir Andrew Wylie* (1822), and *The Entail* (1823) He went out to Canada as superintendent to the Canada Company in 1826, founded the town of Guelph, returned in 1829, and died in 1839. His son, SIR THOMAS TILLOCH, was an eminent statesman.

Galton (gal'tun), FRANCIS, scientist, born at Duddeston, near Birmingham, in 1822. Graduating at Cambridge in 1844, he made two journeys in Africa, which led to his *Narrative of an Explorer*. He is best known by his books on *Hereditary Genius*, *Natural Inheritance*, *Finger Prints*, etc. He died in 1911.

Galvani (gäl-vä'nē), LUIGI, an Italian physician and physiologist, born at Bologna 1737; died 1798. He practised medicine in Bologna, and was in 1762 appointed professor of anatomy at the university. He gained repute as a comparative anatomist; but his fame rests on his theory of animal electricity, enunciated in the treatise *De Viribus Electricitatis in Motu Musculari Commentarius*, published in 1791. Twenty years before the publication of this treatise he had been making experiments on the relations of animal functions to electricity.

In 1797 he was deprived of his chair for refusing to take the oath of allegiance to the Cisalpine Republic, but was restored to it in less than a year. See also the article *Galvanism*.

Galvanic Battery (gal-van'ik), a combination of galvanic cells. In a galvanic cell chemical action takes place between a liquid and a metal—usually zinc—which is partially immersed in it; and there is another metal, or solid conducting substance of some kind, also partially immersed. The zinc and the other solid conductor are called the two *plates* of the cell. The plates must not be allowed to touch each other in the liquid; but a current through an external conductor can be obtained by connecting its ends with the two plates. When this connection is made there is a complete circuit round which the current flows, its course being from the zinc plate through the liquid to the other plate, and from this latter through the external conductor to the zinc plate again. There is a continual circulation of positive electricity in this direction as long as the chemical action continues, or, what is the same thing, there is a continual circulation of negative electricity in the opposite direction. The second or inactive plate is usually either of copper, of platinum, or still more frequently of gas carbon, that is, the carbon which is deposited in the retorts at gasworks. The liquid which acts on the zinc is most frequently dilute sulphuric acid—1 part of acid to 6 or 8 of water. In some of the best kinds of cell there are two liquids—one in contact with the zinc and the other with the inactive plate, with a porous partition of unglazed earthenware between them. Fig. 1 shows a battery of four cells of the simplest kind, each containing a plate of zinc and a plate of copper immersed (except their upper portions, in dilute acid contained in a glass vessel. It will be observed that the copper (c) of each cell is connected with the zinc (z) of the next. The arrows show the direction of the current. Fig. 2 represents a very common form of battery called Bunsen's. The zinc plate consists of a slit cylinder surrounding the porous vessel in which the carbon plate stands, the whole being contained in a glass jar. The liquid in which the zinc is immersed is dilute sulphuric acid, and the liquid in contact with the carbon is strong nitric acid. Fig. 3 represents a Daniell cell, which differs from the Bunsen in the contents of the porous cell. The plate within the porous cell is of copper, and the liquid in contact with the copper is a saturated solution of sulphate of copper, crystals of which are seen heaped up round the top. These crystals are supported by a cage of copper wire, and are intended for keeping the solution saturated.

Fig. 3.—Daniell's Cell.

In the simpler forms of galvanic cell, such as that represented in Fig. 1, there is a continual evolution of hydrogen at the inactive plate, while an equivalent quantity of oxygen enters into combination with the zinc plate, and goes to form sulphate of zinc. Some of the evolved hydrogen adheres to the copper plate and produces a rapid falling off in the electromotive force of the cell. This action, which is the principal cause of the rapid weakening of the current in batteries composed of such cells, is called *polarisation*. The purpose of the two-fluid arrangement illustrated in Figs. 2 and 3, is to intercept the hydrogen and prevent it from being deposited on the copper or carbon plate. In Daniell's battery, which was the first of the kind, the hydrogen is taken up by the solution of sulphate of copper, and displaces copper, which is deposited on the copper plate. In Bunsen's it is taken up by the nitric acid, which is thus gradually converted into nitrous acid.

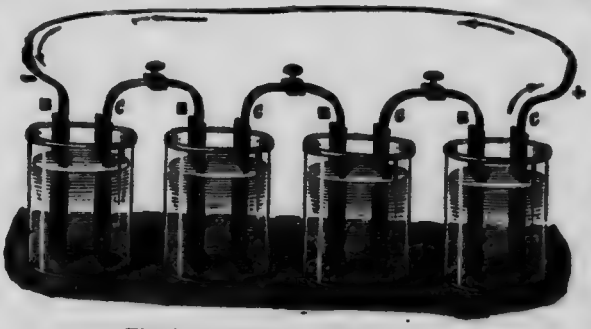


Fig. 1.—Simple Galvanic Battery.

It is usual to amalgamate the zinc

plates of a battery by washing them with acid, and then rubbing them with mercury. The reason for this operation is, that when ordinary commercial zinc is used without amalgamation, local currents are formed between different portions of the same plate, owing to inequalities or impurities. This *local action*, as it is called, eats away the plates without contributing to the current in the general circuit. Amalgamation renders the surface uniform and prevents this injurious action.

The strength of the current given by a battery depends partly on the electromotive force of the battery and partly on its resistance. If two batteries are connected into one circuit in such a way that they tend to drive currents round it in opposite directions, the one which prevails is said to have the greater electromotive force. The electromotive force is proportional to the number of cells, and is independent of their size. As regards resistance, the current will be strongest when the resistance is least; that is, when the plates are very large and very near together.

Fig. 2.—Bunsen's Battery.

Whenever chemical action takes place, heat is produced; but in the ordinary use of a galvanic battery only a portion of this heat is produced in the cells themselves; the rest of it is produced in the external conductor. When we heat a wire by sending the current of a battery through it, the heat generated in the wire is a portion of the heat due to the chemical action in the cells. In cells of high electromotive force the heat due to the chemical action is greater (for the same quantity of zinc dissolved) than in cells of low electromotive force. It is much higher for a Bunsen than for a Daniell cell.

Galvanism (gal'van-izm), the production of electricity by means of the galvanic battery (which see). The name is derived from Galvani, professor of anatomy at Bologna, who observed that the limbs of a dead frog could be caused to move by the contact of metals. His experiments attracted the attention of Volta, professor of natural philosophy at Pavia, who shortly afterwards invented the galvanic or voltaic battery.

Galvanized Iron (gal'van-izd), a name incorrectly given to sheets of iron coated with zinc by a non-galvanic process, the iron being first cleansed by friction and the action of dilute sulphuric acid, and then plunged into a bath composed of melted zinc and other substances, as sal ammoniac or mercury and potassium. More properly the name is given to sheets of iron coated first with tin by a galvanic process, and then with zinc by immersion in a bath containing fluid zinc covered with sal ammoniac mixed with earthy matter. So long as the coating is entire, and so long as it is not exposed to corrosive substances, galvanized iron is very durable. The best variety is immersed into the zinc three times and rubbed smooth between the dippings.

Galvanometer (gal-va-nom'e-ter), an instrument for measuring an electric current by the deflection of a magnetic needle. The current flows through a wire coiled usually into the form of a circle, which is placed vertically in the magnetic meridian and surrounds the needle. When no current is passing the needle points north and south, and the

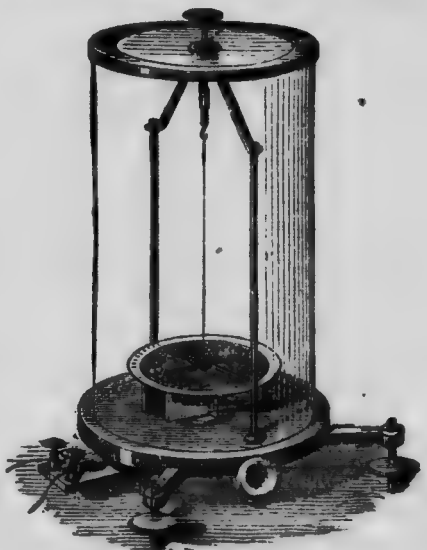


Fig. 1.—Astatic Galvanometer.

galvanometer should be so placed that the needle when so pointing lies in the plane

of the coil. When a current passes through the coil, it exerts a force upon the needle tending to set it at right angles to the plane of the coil—that is, to set it east and west. The action of the earth, on the other hand, tends to set it north and south, and it will actually take an intermediate position which varies with the strength of the current. This position is read off on a graduated circle (the upper of the two graduated and horizontal circles in Fig. 2), usually by means of a long light pointer (shown in the figure) which is attached to the needle at right angles. In some galvanometers, as in that represented in Figure 2, the coil can be turned till it overtakes the needle. The lower graduated circle is for the purpose of measuring the amount of this rotation.

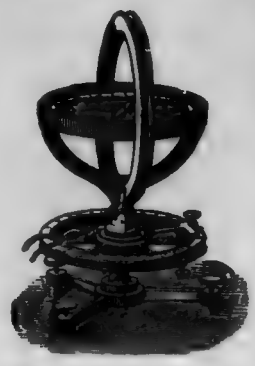


Fig. 2.—Sine Galvanometer.

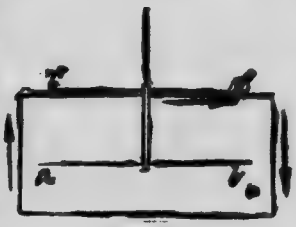


Fig. 3.

For measuring very feeble currents, it is more usual to employ the 'astatic' galvanometer, represented in Fig. 1. It has two needles, *a' b'*, *a b* (Fig. 3), as nearly equal as possible, fastened to one upright stem, *with their poles pointing opposite ways*. The directive actions of the earth on the two needles are opposite, and hence the resultant directive action of the earth on the two combined is very small. The coil of the galvanometer, on the other hand, is so placed that the current tends to deflect both needles the same way. The coil, which is shown in section in Fig. 3, is approximately rectangular, its longest dimension being horizontal. One of the needles *a'b'* is just above and the other *a b* is below the upper part of the coil. The current in this part of the coil would urge them opposite ways if their poles were similarly directed, but as their poles are oppositely directed it urges them the same way. The current in the lower part and ends of the coil assists in deflecting the lower needle, and is too distant from the upper needle to have much effect upon it. The coil is thus placed in a position of great advantage as compared with the earth, and the deflection is proportionately large.

Much greater sensitiveness can be obtained by the use of the mirror-galvanometer (Fig. 4). The round box in the center contains a coil of some hundreds of convolutions, with a very small needle fastened to a little glass mirror suspended in its center by a silk fiber. The mirror, with the needle fastened to its back, is shown at M in Fig. 5. Light from a lamp comes through the hole S and falls upon the mirror, which, being slightly concave, reflects it to a focus on the scale A A, where a bright image of the flame is accordingly seen. The smallest angular movement of the mirror causes a very visible movement of the bright image on the scale. The curved bar M in Fig. 4 is a magnet (called the *controlling magnet*), which can be raised or lowered, and turned round. One use of it is to bring the needle into the plane of the coil when the coil is not standing north and south.

Fig. 4.—Mirror Galvanometer.

Galvanoplasty (gal-van-o-plas'ti), Same as *Electrometallurgy*.

Galveston (gal'ves-tun), a seaport of Texas, at the northeast extremity of Galveston Island, at the mouth of Galveston Bay, about 200 miles W. by S. from New Orleans. It is the most flourishing port in the Gulf of Mexico, especially for the exportation of cotton, of which the shipments are very large. The chief buildings are the custom and market houses, the town-hall, a number of churches, including a Gothic Episcopal Church and Roman Catholic cathedral, and the Roman Catholic University of St. Mary. There are nine miles of street railroad, and a canal connects the port with Brazos River. In September, 1900, the city was struck by a tropical hurricane, the pressure of the wind being so great as to lift the waves many feet above the high tide level, the inflowing gulf water sweeping all before it. The loss of life was over 8000, and the de-

struction of property very great. The ruined part of the city has been rebuilt and raised several feet and strong sea-walls erected to keep out any future flood.

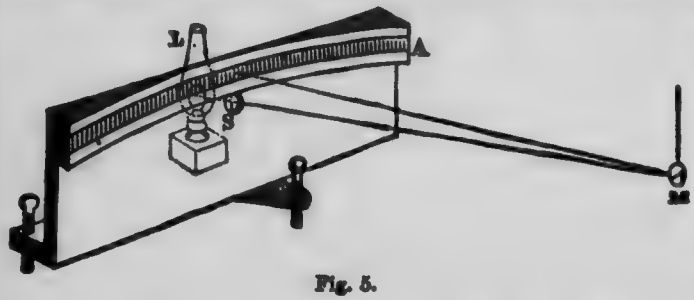


Fig. 5.

In addition to the commerce, there are numerous manufacturing industries. Pop. 36,981.

Galway (gal'wā), a seaport of Western Ireland, province of Connaught, capital of county of same name, at the mouth of the Corrib, in Galway Bay, 117 miles west of Dublin. It consists in its older parts of narrow, irregular streets with antique houses, crowded with a pauper population; in the more modern parts it is spacious and well built. Besides numerous churches and chapels, it has three monasteries and five nunneries. The town-house and county-hall and the Queen's College are among its best buildings. The manufactures are insignificant, and the trade, though once important, is no longer worthy of its excellent harbor. The chief exports are agricultural produce and marble. There are mills for sawing and polishing marble, a brewery, distillery, etc. Pop. 13,414. The county, which is washed by the Atlantic, has an area of 2372 sq. miles, of which one-eighth is under crops. In the northwest or district of Connemara, it is rugged and mountainous; in the east, level but extensively covered with bog; and in the south, fertile and tolerably well cultivated, producing wheat, barley, and oats. Lough Corrib, which lies wholly within it, is the third largest lake in Ireland. The minerals include lead, limestone, marble, and beautiful serpentine. The fisheries are valuable, but much neglected. The principal manufactures are coarse woolens and linens. Pop. 192,549.

Galway Bay, a large bay on the west coast of Ireland, between County Galway on the north and County Clare on the south, about 30 miles in length and from 20 to 7 miles in breadth. Across its entrance lie the Aran Islands, and there are numerous small islands in the bay itself.

Gama (gä'ma), Dom Vasco da, the first navigator who made the voyage to the East Indies by the Cape of Good Hope, was born in 1450 at Sines, Portugal, of a noble family. The voyage had been projected under John II, and his successor, Emmanuel the Fortunate, having fitted out four vessels, entrusted Gama with the chief command. He sailed from Lisbon on July 8th, 1497, and doubling the Cape, visited Mozambique, Mombaza, Melinda, and Calicut, returning to Lisbon in 1499. For this exploit he was named Admiral of the Indies and received the title of Dom, with an annual pension and extensive privileges in Indian commerce. In the year 1502 he was placed at the head of a powerful fleet, with which he provided for the security of future voyagers by founding establishments at Mozambique and Sofala. He also inflicted signal reprisals on the town of Calicut, where the Portuguese residents had been massacred, and established the first Portuguese factory in the Indies. He re-entered Lisbon in 1503, and passed the next twenty years in obscurity. In 1524 he was appointed Viceroy of India by King John III, but his administration lasted only three months, his death taking place at Goa in the December of that year.

Gama Grass. See *Buffalo Grass.*

Gamaliel (ga-mā'li-el), the name of two persons mentioned in Bible history, of whom the first, Gamaliel, the son of Pedahzur (Numbers, i, 10; ii, 20; vii, 54, 59; x, 23) was prince or head of the tribe of Manasseh. The other and better known Gamaliel is mentioned twice in the Acts of the Apostles as a learned doctor of the law, of the sect of the Pharisees. From Acts, xxii, 3, we learn that he was the preceptor of St. Paul: the other reference (Acts, v, 34) records his famous advice to the Sanhedrim as to their treatment of the apostles. According to tradition, Gamaliel became a Christian, and was baptized by St. Peter and St. Paul.

Gambeson (gam'be-sun), See *Acton.*

Gambetta (gam-bet'a), Leon Michel, a French orator and statesman, born in 1838 at Cahors, of a family of Genoese extraction. He was educated for the church, but finally decided in favor of the law, and repairing to Paris became

a member of the metropolitan bar in 1859. In November, 1868, he gained the leadership of the republican party by his defense of Delescluze, a noted republican. In 1869, having been elected by both Paris and Marseilles, he chose to represent the southern city; and in the Chamber of Deputies showed himself an irreconcilable opponent of the empire and its measures, especially of the policy which led to the war with Prussia. On the downfall of the empire, after the surrender of Sedan in 1870, a government for the national defense was formed, in which Gambetta was nominated minister of the interior. The Germans having encircled Paris, he left that city in a balloon, and set up his headquarters at Tours, from which, with all the powers of a dictator, he for a short time organized a fierce but vain resistance against the invaders. After the close of the war he held office in several short-lived ministries, and in November, 1881, accepted the premiership. The sweeping changes proposed by him and his colleagues speedily brought a majority against him, and after a six weeks' tenure of office he had to resign. The accidental discharge of a pistol caused his death in December, 1882.

Gambia (gâm'bi-a), a British colony in West Africa, at the mouth of the river Gambia; area, 69 square miles. The climate is very unhealthy in the rainy season, and there is little fertile land in the colony, but a considerable trade is done in ground-nuts, hides, bees'-wax, rice, cotton, maize, ivory, ginger, gum-arabic, palm-oil, etc. Pop. 13,500.

Gambia, a river of West Africa, rising in a mountainous district in Futa Jallon and flowing N. W. and W. to the Atlantic; length about 1400 miles. It is navigable for 600 miles during seven months of the year for vessels of 150 tons, but from June to November the river becomes a torrent, rising from 20 to 50 feet and leaving a rich alluvial deposit on its shores.

Gambier Islands (gam'bi-ẽr), a group of small coral islands in the South Pacific, about lat. 23° 8′ S. and lon. 134° 55′ W.; belonging to France. The vegetation is luxuriant and there are numerous birds but no indigenous quadrupeds. A French mission station was formed on the largest island, Mangareva, in 1834. Pop. about 2300.

Gambier, an astringent, earthy-looking substance chiefly employed in tanning and dyeing, and obtained from East Indian trees *Uncaria* (*Nauclea*) *gambir* and *U. acida*, order Cinchonaceæ. It is mainly imported from Singapore. Also called *Terra Japonica* and *Pale Catechu*.

Gambling. See *Gaming*.

Gamboge (gam-bōj'; from *Camboja* or *Cambodia*), a concrete, vegetable, inspissated juice or sap, or gum-resin, yielded by several species of

Gamboge Plant (*Garcinia Hanburii*).

trees. The gamboge of European commerce appears to be mainly derived from *Hebradendron gambogoides* (or *Garcinia Morella*), a dicœcious tree with handsome laurel-like foliage and small yellow flowers, found in Cambodia, Siam, and in the southern parts of Cochin-China. It is yellow, and contained chiefly in the middle layer of the bark of the tree; it is obtained by incision, and issues in the form of a yellowish fluid, which, after passing through a viscid state, hardens into the gamboge of commerce. It consists of a mixture of resin with 15 to 20 per cent. of gum. Gamboge has drastic purgative properties, but is seldom administered, except in combination with other substances. In doses of a drachm or even less it produces death. Other species of *Garcinia* yield a similar drug, which is collected for local use, but not for exportation. The so-called American gamboge is the juice of *Visima Guianensis*.

Gambrinus (gam-bri \), a mythical king Flanders, to whom is ascribed the inv.. ion of beer. His figure, often seated on a cask, and holding a foaming tankard, is familiar in German beer cellars.

Game Laws (gām lâs), laws relating to the killing of certain wild animals pursued for sport, and called game. Formerly in Britain certain qualifications of rank or property were needed to constitute the right to kill game; but by the Game Act of William IV the necessity for any qualification except the possession of a game certificate was abolished, and the right given to any one to kill game on his own land, or on that of another with his permission. The animals designated as

game by this act are hares, pheasants, partridges, grouse, heathgame, or moorgame, blackgame, and bustards. Poaching, or trespassing in pursuit of game, is punished by severe laws, especially if done at night. In the United States any one is free to capture or kill wild animals, subject to the laws of trespassing, but laws have been enacted for the protection of game during the breeding season, so as to prevent its extermination. Each state has its own game laws, applicable to its special game animals and covering its various wild animals and birds, and river and lake fish are protected during certain seasons under similar laws.

Game Preserves, enclosures for the preservation of game, for the benefit of royal or other hunters, which have for centuries been common in Britain and other countries of Europe. They have only recently been introduced into the United States, in which the hunting grounds have long been freely open to the hunter. Their purpose here is the preservation and increase of wild animals instead of their destruction. Deer parks have long been kept in this country, but the first systematic attempt to foster wild game was made about 1860 by Judge J. D. Caton, in a park of Ottawa, Illinois. Chief among those that followed on a large scale is the great game park of Austin Corbin, near Newport, N. H., an enclosure of 36,000 acres, in which a wire fence 8 feet high encloses an oblong tract 12 by 5 miles, through which passes a mountain range 3000 feet high. American game of all kinds are kept here, from buffalo, elk, and moose to the smaller and more timid varieties, and there has been a rapid increase. Dr. J. Seward Webb has a 9000-acre preserve in the Adirondacks, and various other large parks have been established elsewhere, in which our fast disappearing game animals are augmenting in numbers and game birds of foreign origin have been introduced.

Games (gāms), a name of certain sports or amusements carried on under regular rules and methods, as with cards or dice, billiards, tennis, etc. Among the ancients there were public games or sports, exhibited on solemn occasions, in which various kinds of contests were introduced. The Grecian games were national festivals attended by spectators and competitors from all parts of Greece, the chief being the Olympic, Pythian, Nemean, and Isthmian. They consisted of chariot races, running, wrestling, and boxing matches, etc., and to be victorious in one of these contests was esteemed one of the highest honors of a Greek citizen. The Roman games (*ludi*) were held chiefly at the festivals of the gods. They might, however, be exhibited by private persons to please the people, as the combats of gladiators, theatrical representations, combats of wild beasts in the amphitheater, etc. With the exception of the gladiatorial and wild beast combats, most of these games have descended to modern times and have been supplemented by others of modern invention, while efforts are being made to eliminate those of a brutal character. See such articles as *Billiards*, *Chess*, *Cricket*, *Football*, etc.

Gaming (gām'ing), or GAMBLING, the practice of indulging in games involving some element of chance or hasard with a view to pecuniary gain. In many countries such games, and the collateral practices of betting on events, taking shares in lotteries, etc., are legally prohibited or restricted, as being frequently associated with fraud and as themselves demoralizing. At other times governments, tempted by the prospect of gain, have openly encouraged gambling by licensing gaming houses, or instituting lotteries under their own authority. (See *Lottery.*) In France public gaming-tables were suppressed from January 1, 1838, but lotteries are still sometimes carried on. Previous to the formation of the German Empire gambling was encouraged in both of the ways referred to in several of the principalities of Germany. Baden-Baden, in the Grand-duchy of Baden, and Homburg, in Hesse-Homburg, were the two most famous resorts in Europe of the frequenters of gaming-tables. After the formation of the empire gaming was suppressed in these places (December 31, 1872), and since that time the Italian principality of Monaco has become the last public resort of this species of gambling.

In Great Britain enactments dating back for centuries have been passed for the regulation of gambling, though it is practically impossible to eradicate it. In this country statutes have been passed in most, if not all, of the States, forbidding gambling for money at certain games, and prohibiting the recovery of money lost at such games. Gambling, however, is very widely practised in most of our great cities.

Gamut (gam'ut), or GAMMUT, in music, the entire series of musical tones in the natural order of ascent or descent. With the musicians of the eleventh century A represented the lowest note in their instruments, and

a lower note having been introduced, the Greek gamma (*Γ*) was taken to represent it. From its prominent place as first note of the scale its name was taken to represent the whole.

Gandak, GUNDUK (gun-duk'), a river of Northern Hindustan, rising in the Himalayas and entering the Ganges; length 400 miles.

Gandia (gän'dē-ä), a town and port of Spain, in the province and 34 miles south by east of Valencia, on the Alcoy. It is walled and well built, with a handsome Gothic church and a fine palace of the dukes of Gandia. Pop. 10,026.

Gando (gän'dō), a kingdom of the Western Soudan, intersected by the Niger, and inhabited chiefly by Fellatahs, with a capital of same name. It is very fertile, and has a population estimated at 5,500,000. Mohammedanism is the prevalent religion. The ruler is a sultan subordinate to that of Sokoto.

Ganesa (ga-nā'sa), an Indian god, the son of Siva and Pārvati, represented by a figure half man half elephant, having an elephant's head. He is the god of prudence and good luck, and is invoked at the beginning of all enterprises. There are not many temples dedicated to him, and he has no public festivals, but his image stands in almost every house.

Ganesa.

Ganga (gan'ga), a name given to the sand-grouse (*Pterocles arenarius*).

Ganga, in Hindu mythology, the personified goddess of the river Ganges.

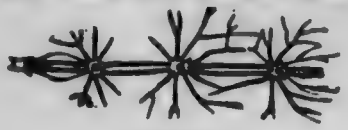
Ganges (gan'jēz), a river of Hindustan, one of the great rivers of Asia, rising in the Himalaya Mountains, in Garhwāl state, and formed by the junction of two head streams, the Bhagirathi and the Alaknanda, which unite at Deoprag, 10 miles below Srinagar, 1500 feet above sea level. The Bhagirathi, as being a sacred stream, is usually considered the source of the Ganges, rising at the height of 13,800 feet, but the Alaknanda flows further and brings a larger volume of water to the junction. At Hardwar, about 30 miles below Deoprag, the river fairly enters the great valley of Hindustan, and flows in a southeast direction till it discharges itself by numerous mouths into the Bay of Bengal, after a course of about 1700 miles. During its course it is joined by eleven large rivers, the chief being the Jumna, Son, Ramganga, Gumti, Gogra, Gandak, and Kusi. In the rainy season the flat country of Bengal is overflowed to the extent of 100 miles in breadth, the water beginning to recede after the middle of August. The Ganges delta has the Hugli on the west, the Meghna on the east, and commences about 200 miles, or 300 by the course of the river, from the sea. Along the sea it forms an uninhabited swampy waste, called Sunderbunds, or Sundarbans, and the whole coast of the delta is a mass of shifting mud banks. The westernmost branch, the Hugli, is the only branch commonly navigated by ships. The Meghna, or main branch, on the east is joined by a branch of the Brahmaputra. Some of the principal cities on the Ganges and its branches, ascending the stream are Calcutta, Murshedabad, Bahar, Patna, Benares, Allahabad, Cawnpore, and Faruckabad. The Ganges is navigable for boats of large size nearly 1500 miles from its mouths, and it forms a great channel for traffic. It is an imperative duty of the Hindus to bathe in the Ganges, or at least to wash themselves with its waters, and to distribute alms, on certain days. The Hindus believe that whoever dies on its banks, and drinks of its waters before death, is exempted from the necessity of returning into this world and commencing a new life. The sick are therefore carried to the bank of the Ganges, and its water is a considerable article of commerce in the remoter parts of India.

Ganges Canal, UPPER, a lateral canal in Northern India (N. W. Provinces), constructed for purposes of irrigation and supplementary navigation, extending on the right of the Ganges from Hardwar to Cawnpore. The trunk of the canal measures 445 miles, and the total cost of the works has been about $14,000,000.—The LOWER GANGES CANAL is a sort of continuation of the Upper, intended for irrigation purposes.

Gangi (gän'jē), a town of Italy, prov. Palermo, overlooked by an old castle. Pop. 11,551.

Ganglion (gang'gli-un), in anatomy, an enlargement occurring

somewhere in the course of a nerve, and containing nerve cells in addition to nerve filaments. There are two systems of nerves which have ganglia upon them.



GANGLION.

Part of the nervous system of the larva of a beetle. (*Calosoma sycophanta*). a a, Ganglia.

First, those of common sensation, whose ganglia are near to the origin of the nerve in the spinal cord. Secondly, the great sympathetic nerve, which has ganglia on various parts of it. In the invertebrates, ganglia are centers of nervous force, and are distributed through the body in pairs, one for each ring of the body, connected by fibers, as in the figure. The cerebral ganglia of vertebrates are the brain itself, the masses of gray matter at the base of the brain, as the optic thalamus, etc.

Gangpur (gäng'pör), a native state of Bengal, in Chota Nagpur, consisting mainly of hills, forest, and jungle; area, 2484 sq. miles; pop. about 238,896.

Gangrene (gang'grēn), the death of some part of a living body, wherein the tissues begin to be in a state of mortification, there being also complete insensibility. A gangrened part must be removed either by amputation or by natural process, but if a vital part is so affected death will ensue.

Gangue (gang), a mineral substance surrounding a metallic ore in a vein.

Gangway (gang'wā), a narrow platform or bridge of planks along the upper part of a ship's side for communication fore and aft: also a sort of platform by which persons enter and leave a vessel.—In the House of Commons the gangway is a passage across the house, which separates the ministry and the opposition with their respective adherents, who sit on seats running along the sides of the house, from the neutral or independent members, who occupy seats running across. Hence, the phrase *to sit below the gangway*, as applied to a member, implies that he holds himself as bound to neither party.

Ganja. Same as *Hashish*.

Ganjam (gun-jäm'), a decayed town of India, in the Madras Presidency, formerly capital in the district of same name, near the coast of the Bay of Bengal. It was at one time a flourishing place; but the town has declined since the epidemic of 1815, when Berhampur became the headquarters. The principal arm of the Ganjam River, which enters the sea to the south of the town, is about one-third of a mile broad. —The district, one of the five Circars, is one of the most productive under the Madras Presidency, yielding rice, cotton, sugar, rum, and pulse, etc. Area, 8313 square miles; pop. 2,010,256.

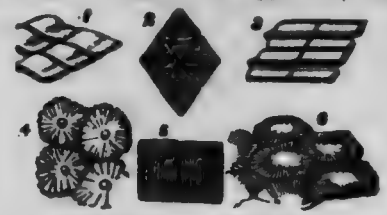
Gannet (gan'et), the solan goose, a bird of the genus *Sula* (*S. Bassana*), family Pelecanidæ. It is about 3 feet in length, and 6 in breadth of wings from tip to tip; the whole plumage, a dirty white, inclining to gray; the eyes a pale yellow, surrounded with a naked skin of a fine blue color; the bill straight, 6 inches long, and furnished beneath with a kind of pouch. It is found from the Arctic Sea to the Gulf of Mexico; breeds in immense numbers on the rocky islands near the coast of Labrador. The male and female are nearly alike. The food

Gannet or Solan Goose (*Sula Bassana*).

of the gannet consists of salt-water fish, the herring and pilchard being the staple. It takes its prey by darting down on it from a considerable height. It makes its nests, which are composed chiefly of turf and seaweed, in the caverns and fissures of rocks, or on their ledges. The female lays only one egg, though, if it be removed, she will deposit another. The young, which are much darker than the old birds, remain in the nest until nearly their full size, becoming extremely fat. In St. Kilda they form the principal food of the inhabitants, being taken by men lowered from the top of the cliffs.

Ganoids (gan'oidz; *Ganoidei*), the second order of fishes according to Agassiz. The families of this order are chiefly characterized by angular, rhomboidal, polygonal, or circular scales composed of horny or bony plates covered with a thick plate of glossy, enamel-like substance. The ganoids were

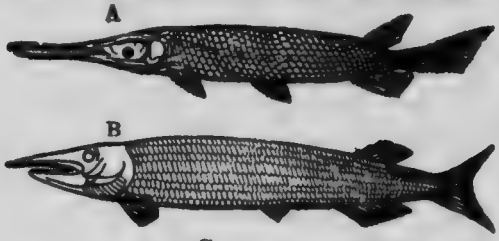
most numerous in Palæozoic and early Mesozoic times, but are now represented by seven genera:—*Lepidosteus*, the bony pikes or garpikes of the North American fresh-water lakes; *Polypterus*, repre-



Scales of Ganoid Fishes.

1, Lepidosteus. 2, Cheiracanthus. 3, Palæoniscus. 4, Cephalaspis. 5. Dipterus. 6. Acipenser.

sented by a single species occurring in rivers of tropical Africa; *Calamoichthys*, a similar genus found in Old Calabar; *Amia*, the fresh-water mudfish of North America; *Acipenser*, represented by the sturgeon; *Scaphirhynchus*, best known by the so-called shovel-nosed sturgeon of the Mississippi basin; and the genus *Polyodon* or *Spatularia*, the paddle-fishes of the Mississippi and great rivers of China. Of the extinct ganoids the most remarkable are the placoderms of the Silurian



Ganoids.

A, *Lepidosteus osseus*, the 'Gar-Pike' of the American Lakes; B, *Aspidorhynchus*, restored (after Agassiz), a Jurassic Ganoid allied to *Lepidosteus*, but having a homocercal tail.

and Devonian period, comprising the earliest known remains of fishes. The Palæozoic ganoids have all heterocercal tails, forms with diphycercal tails not appearing till the secondary period.

Gantung Pass (gan'tung), a wild pass in the Western Himalayas between Bussahir in the Punjab and Tibet. It is covered with perpetual snow, and is 18,295 feet in height.

Ganymede (gan'i-mēd), in Grecian mythology, great-grandson of Dardanus, the founder of Troy, and son of Tros and of Callirrhoë, daughter of Scamander. Zeus sent his eagle to carry him off from Mount Ida to Olympus, where he held the office of cupbearer to the immortals in succession to Hebe.

Gaol (jāl), or Jail, a prison or place of legal confinement. See *Prison*.

Gaol Delivery, in English law, a commission to the judges on assize to try and deliver every prisoner in gaol on their arrival at the assize town.

Gap (gap), a town of Southeastern France, department of Hautes-Alpes. It is the seat of a bishop, and has a trade in wool, fruit, corn, and cattle. Pop. about 9000.

Gaper-shell (gā'per), a lamellibranchiate mollusc, the *Mya truncata*, common on the Atlantic coasts. It has an oblong shell and burrows in sand and mud, where it is sought after for bait and for the table.

Gapes (gāps), a disease of fowls and other Rasorial birds, arising from the presence in the windpipe of small parasitic worms (*Syngamus trachealis*), which, by obstructing the process of inhalation, cause the bird to continually gasp for breath.

Garancin (gar'an-sin), Garancine, the product obtained by treating pulverized madder, previously exhausted with water, with concentrated sulphuric acid at 100° Cent. (212° Fahr.), and again washing with water. The residue thus obtained is found to yield better results in dyeing than madder itself.

Garay (gä'rī), Janos, a Hungarian poet, born in 1812; studied at Pesth, where he held a minor post in the public library. His heroic poem, *Csatár* (1834), was succeeded by a number of dramas, mostly historical, the chief being *Árbocz* (1837), *Ország Ilona* (1837), and *Bátory Erzsébet* (1840). His cycle of historical ballads, showing Uhland's influence, was published in 1847, under the title *Arpádok*, and his lyric poems, *Balatoni Kagylók* ('Shells from Lake Balaton'), in 1843. His last work was a historical epic, *Szent László* ('St. Ladislaus'), published 1850. He died in 1853. His *Life* was published by Ferenczy in 1883.

Garbage (gar'bij), Disposal of. Various methods are in use for the disposal of garbage, or the kitchen refuse: feeding to swine; burying in the ground; cremation and reduction. European and particularly British practice is to mix in one common receptacle all classes of refuse—ashes, tin cans, garbage, etc.—but in the United States garbage is usually separated from other waste. Burning or cremation is generally practiced; but in large cities the reduction process has proved most satisfactory. St. Louis, St. Paul, and Denver estab-

fished reduction plants in 1889, Philadelphia in 1894 and New York in 1896. The garbage is removed to the reduction works, where the grease is extracted and the remaining material made into a fertilizer base. The garbage is placed in large air-tight cylinders and steamed or treated with a light solvent. The grease and water are drawn off, and the grease, after it has risen to the top, offered for sale. The remaining material is pressed and dried and sold to fertilizer manufacturers, or mixed with the proper materials to make a commercial fertilizer.

Garbler (gär'bler), formerly an officer of the city of London, vested with power to enter any shop, warehouse, etc., to examine drugs and spices, and garble (*i.e.* sift out the coarse parts, dirt, etc.), and make clean the same or see that it was done.

Garcia (gär'si-a), Calixto, a Cuban patriot, born at Holguin, Cuba, in 1836; died in 1898. He aided in the revolt of 1868, both with money and in person, displaying such military ability that he was made a major-general of the patriot forces. In 1873, being surprised by the Spanish troops, he fought till all hope of escape vanished, then sought to kill himself, shooting himself in the head. Recovering from his nearly fatal wound, he was sent to Spain and imprisoned until after the peace of 1878. In 1895 he again joined in the patriot outbreak, and continued in it until freedom was won by American aid, in 1898.

Garcilaso de la Vega (gär-thē-lä'sō; properly *Garcias Laso de la Vega*), called the *prince of Spanish poets*, born at Toledo, in 1500 or 1503. He went in his youth to the Spanish court, and in 1529 distinguished himself in the Spanish corps serving against the Turks in Austria. An intrigue with a lady of the court led to his imprisonment on an island in the Danube, where several of his poems were composed. He was subsequently engaged in the expedition against Soliman, and in that against Tunis. He was made commander of thirty companies of infantry in 1536, and accompanied the imperial army against Marseilles, but was mortally wounded in attempting to scale a tower near Fréjus. He died at Nice in that year, and was buried at Toledo. His name is associated with that of his contemporary Boscan in the impetus given to Spanish literature by the imitation of the Italian poetic style as exemplified in Petrarch, Ariosto, and Sannazaro. His works, which consist of eclogues, epistles, odes, songs, sonnets, etc., are considered very graceful and musical.

Garcilaso de la Vega, or Garcias Laso de la Vega, historian of Peru, surnamed the Inca, son of Garcilaso de la Vega, one of the conquerors of Peru, and a princess of the race of the Incas; born at Cuzco, Peru, in 1530 or 1540. Having fallen under the groundless suspicion of the Spanish government, he was sent home in 1560, and died in 1616 or 1620. His great work on the history of Peru is in two parts: the first entitled *Los Comentarios Reales que tratan del Origen de los Incas*, etc. (Lisbon, 1609); the second, the *Historia general del Peru* (Cordova, 1616). He wrote also *Historia de la Florida* (Lisbon, 1609).

Garcinia (gär-sin'i-a), the genus of plants to which the mangosteen and gamboge belong, of the nat. order Guttiferæ.

Gard (gär), a department of Southern France, abutting on the Gulf of Lyons; area, 2256 square miles. The north and west are occupied by the Cevennes and their branches, sloping gradually into a fertile plain, the coastline of which is so low as to form extensive swamps and salines. The drainage belongs partly to the Garonne, but chiefly to the Rhone, which forms the east boundary. Within the department the chief river is the Gard. The rich lower districts produce a large quantity of wine, and are noted for silk culture. Large quantities of salt are made; and lead, coal, iron, etc., are worked. There are silk, woolen, and cotton manufactures. Nîmes is the capital. Pop. 421,166.

Gard, Pont du, a fine Roman aqueduct, in Gard, 10 miles from Nîmes, joining two mountains and passing over the Gardon. It has three tiers of arches, and is 160 ft. high. See *Aqueduct*.

Garda (gär'dä), or Bena'co, Lake (Ital. *Lago di Garda;* the *Benacus Lacus* of the Romans), the largest lake in North Italy, belonging to the Alpine region, between Lombardy and Venice, 33 miles long, north to south, 3 to 11 miles broad, greatest depth 902 ft., 213 ft. above sea level. The Sarca, almost its only affluent, enters at its north end, and it is drained by the Mincio, which issues from its southeast end, near Peschiera. It is well stocked with fish. Steamboats ply on it, and its shores are covered with villas.

Gardaya (gär-dä'yä), or Ghardaya, a town of Algeria, in the Sahara, surrounded by a wall flanked

with towers and entered by ten gates. Pop. about 8000.

Garde Ecossaise (gärd ā-kos-āz), the Scotch guard in the service of the kings of France, first instituted on a regular footing by Charles VII, who in 1453 selected a hundred Scotch archers to form a special bodyguard in recognition of the service of the Scotch soldiery in the Hundred Years' war. There was also another company of a hundred Scots placed at the head of a regular army of fifteen companies of 100 lances each, which was organized. This body was commanded by Scotchmen of the highest rank. James VI, and his sons Henry and Charles, and James II when Duke of York, held in succession the rank of captain in it.

Gardelegen (gär'de-lā-gen), a town of Prussia, gov. of Magdeburg. Pop. 8193.

Garde Nationale (nā-syo-nāl), a guard of armed citizens instituted at Paris, July 13, 1789, for the purpose of preserving order and protecting liberty. At first it numbered 48,000 men, but was increased to 300,000 when it was organized throughout the whole country. Acting as a royalist and reactionary force, it was crushed by Napoleon in 1795. It was reorganized by the Directory and by Napoleon, and again under the Bourbons, to whom, however, it was a source of such disquietude that it was dissolved by a royal ordinance in 1827. Under Louis Philippe it was resuscitated in its old form, and contributed to his overthrow. In 1851 the national guard was again reorganized, but in 1855 it was dissolved. In 1870 the national guard of Paris was again formed for the defense of the city against the Prussians. The resistance of a section of the guard to the decree of disarmament issued under M. Thiers led to the communal war, at the close of which the guard was declared dissolved by the National Assembly (1871).

Garde Nationale Mobile, a body constituted by Napoleon III in 1868, on the suggestion of Marshal Niel, to form bases of regiments to supplement the regular army. It was called into action in 1870-1871, but was too ill organized to be efficient.

Garden City, a village on Long Island, New York, 18 miles E. of New York City. It is a fashionable summer resort, but is chiefly notable for the Gothic Cathedral of the Incarnation, erected in memory of Alexander S. Stewart by his widow. Permanent population about 1000.

Gardenia (gar-dē'ni-a), a genus of trees and shrubs, nat. order Cinchonaceæ, natives of tropical Asia and Africa, bearing beautiful white or yellowish flowers of great fragrance. The genus was named after Dr. Garden, of Charleston, South Carolina.

Gardening. See *Horticulture*.

Garden of the Gods, the name given a remarkable locality in Colorado, near Colorado Springs, notable for the beautiful and fantastic forms taken by its eroded red and white sandstone rocks. The entrance passes through a 'Gateway' formed by bright red rocks 300 feet high. The locality, 500 acres in area, has been converted into a national park.

Garden-spider, also called Diadem or Cross-spider, the *Epeira diadēma*, a common European spider, the dorsal surface of which is marked with a triple yellow cross. It forms a beautiful geometric web.

Garden-warbler (*Sylvia* or *Curruca hortensis*), a migratory song-bird visiting Northern Europe from the end of April to September, and ranking next to the blackcap as a songster. It is rather less than 6 inches long, the head, back, neck, wings, and tail being a greenish brown, the whole under surface of the body a dull brownish white.

Gardes Suisses (gärd swēs), a body of guards under the French kings. Swiss companies served in France from the time of Louis XI, but the institution of the Swiss guards as a complete regiment dates from 1616. Both the officers and men were Swiss, and the companies mounted guard according to the rank of the cantons of their captains. The Swiss guards followed in order of precedence after the French guards, enjoyed liberty of worship, and were exempted from service in Germany, Italy, and Spain. Their attachment to the king made them obnoxious to the people during the revolution, and during the defense of the Louvre in August, 1792, they were massacred without mercy.

Gardiner (gar'di-ner), JOHN STANLEY (1872-), an English zoölogist and anatomist, born at Belfast, Ireland, educated at Marlborough College and Gonville and Gaius College, Cambridge, becoming fellow of the latter college in 1898 and dean 1903-09. He was with the Coral Reef boring expedition to Funafuti, 1896; Maldive and Laccadive expedition, 1899-1901; and with the Indian Ocean expedition on board H. M. S. Sealkirk, 1905. He was appointed uni-

versity lecturer in zoölogy in 1909 and has written numerous papers on oceanographical and zoölogical subjects. He edited the Fauna and Geography of the Maldive and Laccadive Archipelagoes, 1902-03.

Gardiner, LION (1599-1663), an English settler in America. He bought from the Indians in 1639 the small island now known as Gardiner's Island, but which he named Isle of Wight.

Gardiner, SAMUEL RAWSON, historian, born at Ropley, in Hants, England, in 1829; died in 1902. He became professor of history at King's College, London. He wrote *The Thirty Years' War*, *Cromwell's Place in History*, and other historical works of much value.

Gardiner, STEPHEN, an English prelate, believed to have been a natural son of Lionel, bishop of Salisbury, and brother of Elizabeth Woodville, queen of Edward IV. He was born in 1483 at Bury St. Edmunds, and in 1520 took the degrees of D.D. and LL.D. at Cambridge, where he became Master of Trinity Hall. He passed at this time by the name of Dr. Stephens. Having become secretary to Wolsey and a favorite with the king, he was despatched to Rome in 1528 to forward Henry VIII's divorce, and on his return was appointed secretary of state, and in succession archdeacon of Norwich and Leicester, and Bishop of Winchester. He also went on various embassies to France and Germany. He supported the king in renouncing the authority of the pope, but opposed the doctrines of the Reformation, and took an active part in the passing of the six articles and in the prosecution of Protestants. He was successful in contriving the fall of his opponent, Cromwell, but failed to injure Catherine Parr, and fell into disfavor. During the reign of Edward he was imprisoned in the Fleet, deprived of his bishopric, and afterwards imprisoned in the Tower from 1548-53, but Mary restored him to his bishopric, and appointed him lord chancellor. He officiated at her coronation and marriage, and became one of her chief advisers. He took an active part in the persecutions at the beginning of the reign, but was outdone in ferocity by Bonnar. He died in 1555.

Gardiner (gär'di-ner), a city of Kennebec County, Maine, 7 miles S. of Augusta. It is on the west bank of the Kennebec River, which is navigable for large vessels to this place, and it is the headquarters of a large commerce in ice, also in lumber. It has saw and paper mills, door and sash factories and shoe industries. Pop. 6000.

Gardner (gärd'ner), a village of Worcester county, Massachusetts, 15 miles W. of Fitchburg. Its principal industry is chairmaking. Pop. of town (township), 14,699.

Garfield, HARRY A., educator, lawyer, administrator, son of President Garfield, was born at Hiram, Ohio, in 1863. He practiced law in Cleveland, Ohio, became professor of contracts Western Reserve University Law School, 1891-97; professor of politics in Princeton University, 1903-08; and president of Williams College from 1908. He was appointed Fuel Administrator in 1917 by President Wilson.

Garfield (gär'fēld), JAMES ABRAM, an American general and statesman, the twentieth President of the United States, born at Orange, Ohio, in 1831, and worked on a farm till his 14th year. He acquired a good education, however, studied law, and in 1859 was elected to the Ohio state senate. In 1861 he entered the army, was appointed colonel, became chief of staff to Rosecrans, and major-general of volunteers. He resigned his command to enter Congress in 1863. He sat in nine congresses for the same constituency, serving on important committees, and winning ground no less by strong intelligence than uncompromising honesty. In 1880 he was elected to the Senate, and in the same year elected President of the United States. Many reforms seemed about to be inaugurated, when he was shot, July 2, 1881, by a disappointed office seeker named Guiteau in the railway station at Washington. He lingered eighty days, dying at Long Branch, September 19, 1881.

Garfield, JAMES RUDOLPH, son of the preceding, brother of Harry A. Garfield (*q. v.*), was born at Hiram, Ohio, in 1865. He was admitted to the bar in 1888, and was a member of the Ohio legislature, 1896-99. He was a member of the United States Civil Service Commission, was appointed commissioner of corporations, and Secretary of the Interior in the Roosevelt Cabinet, 1907-09.

Garfield, a borough of Bergen county, New Jersey, on the Passaic River, opposite Passaic. It has chemical works, woolen mills, etc. Pop. 10,213.

Garfish, SEA-PIKE, or GARPIKE (*Belone vulgaris*), a fish, known also as the *sea-needle*, making its appearance a short time before the mackerel in their annual visit for spawning. It is long and slender, sometimes 2 or 3 feet in length; the head projects forward into a very long, sharp snout; the sides and belly are of a bright silvery color, and the back green, marked with a dark pur-

pie line. The name garfish or garpike is also given to other species of *Belone*, and to a ganoid fish of the genus *Lepidosteus*, found in the fresh waters of America. See *Bony-pike*.

Garganey (gar'ga-ni; *Anas querquedula*), a species of duck called also 'summer teal,' from visiting Britain in summer and being closely akin to the teal. It is widely spread through the eastern hemisphere.

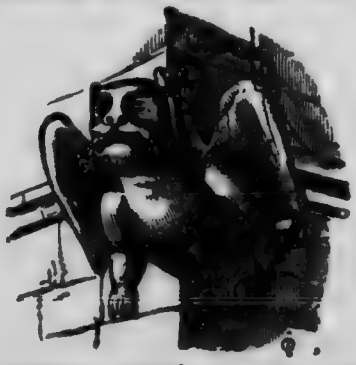
Gargano (gär-gä'nō; Latin, *Garganus*), a group of pine-clad mountains in South Italy, province of Foggia, forming the spur of the boot in the Italian peninsula projecting into the Adriatic. The loftiest summit is Calvo, 5450 feet.

Gargantua (gär-gan'tū-a), the hero of Rabelais's satire, so named from his father exclaiming '*Que grand tu as!*' 'How large (a gullet) thou hast!' on hearing him cry out, immediately on his birth, 'Drink, drink!' so lustily as to be heard over several districts. It required 9000 ells of linen for the body of his shirt, and 2000 more for the gussets, 1100 cowhides for the soles of his shoes, and he picked his teeth with an elephant's tusk.

Gargarrus (gär'ga-rus; Turkish, *Kasdagh*), the highest mountain of the ridge of Ida, in Asia Minor, near the Gulf of Adramyti, on the north.

Gargle (gär'gl), a liquid application to the throat. In using a gargle the head should be thrown well back so as to keep the liquid in contact with the throat, and by expelling the air from the lungs through the liquid the passage may be thoroughly washed. Care should be taken not to swallow the gargle.

Gargoyle (gär'goil), in Gothic architecture, a projecting spout, for throwing the water from the gutter



of a building, usually of some grotesque form, such as the head or figure of an animal or monster.

Garhmukhtesar. See *Gurmukteswar*.

Garhwal (gar-hwäl'), or Gurhwal, a district in the Northwest Provinces, India, bounded on the north by Tibet, east by Kumáun, south by Bijnaur district, and west by the Garhwal state; area, 5500 sq. miles; pop. 429,000. There are good roads, and a considerable trade with Tibet.

Garhwal, or Tehri, a native Indian state under British protection, west of the district of the same name; area, 9180 sq. miles; pop. 268,825. Chief town, Tehri; chief river, the Alaknanda and other headwaters of the Ganges. It is situated in the Himalayas.

Garibaldi (gar-e-bäl'de), Giuseppe, an Italian patriot and hero, was born at Nice, 1807, his father being a poor fisherman. He got little education, and for a number of years was a

Giuseppe Garibaldi.

sailor on various trading vessels. In 1834 he became a member of the 'Young Italy' party, and being condemned to death for his share in the schemes of Mazzini, escaped to Marseilles, too. service in the fleet of the Bey of Tunis, and finally went to South America. In the service of the Republic of Rio Grande against the Brazilians he became known as a brilliant leader, and with his famous Italian legion he subsequently gave the Montevideans such effective aid against Buenos Ayres as to earn the title of 'hero of Montevideo.' In 1848 he returned to Italy, raised a band of volunteers, and harassed the Austrians until the cessation of hostilities and re-establishment of

Austrian supremacy in Lombardy. He then retired to Switzerland, but in the spring of 1849 proceeded to Rome to support Mazzini's republic. He was appointed to command the forces, but the odds were overwhelming, and after a desperate defense of thirty days Garibaldi escaped from Rome with 4000 of his followers. In the course of his flight his wife Anita died from fatigue and privations. He reached the United States, and was for some years in command of a merchant vessel. He then purchased a part of the small island of Caprera, off the north coast of Sardinia, and made this his home for the rest of his life. The subscriptions of his admirers enabled him in time to become owner of the whole island. In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his Chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island, wrested it after a fierce struggle from the King of Naples, recrossed to the mainland and occupied Naples, where he was proclaimed Dictator of the Two Sicilies. It was now feared that Garibaldi might prove untrue to his motto—Italy and Victor Emmanuel—but he readily acquiesced in the annexation of the Two Sicilies to Italy, and declining all honors, retired to his island farm. In 1862 he endeavored to force the Roman question to a solution, and entered Calabria with a small following, but was taken prisoner at Aspromonte by the royal troops. He was soon released, however, and returned to Caprera. In 1864 he received an enthusiastic welcome in Britain. In 1866 he commanded a volunteer force against the Austrians in the Italian Tyrol, but failed to accomplish anything of consequence. Next year he attempted the liberation of Rome, but near Mentana was defeated by the French and pontifical troops, and was again imprisoned by the Italian government, but soon pardoned and released. In 1870 he gave his services to the French republican government against the Germans, and with his 20,000 men rendered valuable assistance in the southeast. At the end of the war he was elected a member of the French assembly, but speedily resigned his seat and returned to Caprera. Rome now became the capital of united Italy, and here in January, 1875, Garibaldi took his seat in the Italian parliament. The latter part of his life was spent quietly at Caprera. After 1870 he wrote two or three novels—but these are very mediocre productions. He died somewhat suddenly in 1882. His autobiography has been published in English.

Gariep (ga-rēp'). See *Orange River*.

Garigliano (gä-ril-yä'nō), a river of S. Italy, formed by the junction of the Liri and Sacco near Pontecorvo. After a course of 40 miles it falls into the Gulf of Gaëta; but if the Liri is regarded as the same stream, its length is more than double.

Garland (gar'land), Augustus Hill, statesman, born near Covington, Tennessee, in 1832; died in 1899. He settled in Arkansas, was a member of the Confederate Congress, 1861-65, and was elected to the United States Senate in 1867, but not permitted to take his seat. He was elected Governor of Arkansas in 1874, and United States Senator in 1876 and 1883, and in 1885 was appointed by President Cleveland Attorney-General of the United States.

Garland, Hamlin, author, born at West Salem, Wisconsin, in 1860. His first book, *Main Traveled Roads*, was published in 1890, and attracted attention by its delineation of the hardships of Western farm-life. Later works were *Prairie Folks*, *Her Mountain Lover*, *Tyranny of the Dark*, *The Long Trail*, *The Shadow World*, etc.

Garlic (gär'lik; *Allium sativum*), a hardy, perennial allied to the onion, indigenous to the south of Europe, and forming a favorite condiment amongst several nations. The leaves are grass-like, and differ from those of the common onion in not being fistulous; the stem is about 2 feet high; the flowers are white; and the root is a compound bulb, consisting of several smaller bulbs, commonly denominated *cloves*, enveloped by a common membrane. It has a strong, penetrating odor, and a pungent, acrid taste. Used as a medicine, it is stimulant, tonic, and promotes digestion; it has also diuretic and sudorific qualities, and is a good expectorant.—*Oil of garlic* is a sulphide of allyl, $(C_3H_5)_2S$, a colorless, strongly-smelling oil, exceedingly irritant to the palate and the skin. It is contained also in the onion, leek, asafœtida, etc.

Garnet (gär'net), a beautiful mineral, or group of minerals, classed among the gems, and occurring generally in mica-slate, hornblende-slate, gneiss, and granite, usually as more or less regular crystals of from twelve to sixty or even eighty-four sides. The prevailing color is red of various shades, but often brown, and sometimes green, yellow, or black. They vary considerably in composition, but admit of classification into three principal groups according to their chief sesquioxide basic

components, viz., alumina, iron, and chrome garnets. Among the varieties are common garnets, pyrope, alamandine, precious or oriental garnet, allochroite, melanite or black garnet, etc. By jewelers garnets are classed as Syrian, Bohemian, or Cinghalese, rather, however, from their relative value and fineness than as necessarily implying that they came from these places. The first, named after Syrian, in Pegu, long the chief mart for garnets, are the most esteemed, being a violet-purple unmixed with black and taking an orange tint by artificial light. The Bohemian garnet is usually a dull poppy red with hyacinth orange tint when held between the eye and the light; the pyrope is a full crimson form of this class. Coarse garnets reduced to powder are sometimes used in place of emery for polishing metals.

Garofalo (gȧ-rof'ȧ-lo), BENVENUTO, (properly *Benvenuto Tisio da Garofalo*), an Italian historical painter, born at Ferrara in 1481. He painted at Cremona and at Rome, where he became intimate with Raphael, and then returned to Ferrara, where he died blind in 1559. His works show the influence of the Lombard school and still more of Raphael, though it is denied that he was an imitator of the latter. Examples of his work are to be found in Ferrara, Florence, Rome, and London, and most of the leading galleries.

Garo Hills (gȧ'rō), a district of N. E. India, forming the southwestern corner of Assam; area, 3146 sq. miles. It is a mountainous and forest region intersected by tributaries of the Brahmaputra. The native Garos are a robust and active race. Among them the wife is regarded as the head of the family, and property descends through females. Pop. 110,000.

Garonne (gȧ-rōn; Lat. *Garumna*), a river of S. W. France, rising in the vale of Aran, in the Spanish Pyrenees; length, about 350 miles. It enters France and flows northwest to the Atlantic, through Haute-Garonne, Tarn-et-Garonne, Lot-et-Garonne, and Gironde. Below Toulouse it receives, on the left, the Save, Ratz, Gers, Baise, etc.; on the right, the Tarn, the Lot, and the Dordogne, on joining which, it changes its name to the Gironde. It is navigable on the descent from St. Martory, and both ways from Toulouse. The Canal du Midi, joining it at Toulouse, forms a communication between the Atlantic and the Mediterranean at Narbonne, and the Canal Latéral, from Toulouse to Castets-en-Dorthe (Gironde), supplements its direct navigation.

Garonne, HAUTE, a department of the south of France, one of the five separated by the Pyrenees from Spain. It is traversed from south to north by the higher reaches of the Garonne and for about 26 miles by the Canal du Midi. The valleys and the lower northern districts are often of great fertility, and cereals and wine are largely exported. Hemp, flax, oranges, and tobacco are also much grown. The principal mines are lead, copper, coal, antimony, iron, and zinc, and a fine marble is quarried. There is a large transit trade with Spain. Capital of department, Toulouse. Area, 2529 sq. miles. Pop. 448,481.

Garrick (gȧr'ik), DAVID, actor, born at Hereford, in 171[illegible]. His grandfather was a French refugee, his father a captain in the army. He was educated at Lichfield grammar school, spent a short time at Lisbon with an uncle, and returning to Lichfield was placed under Samuel Johnson, who was induced to accompany him to the metropolis (1736). Garrick then began to study for the law, but on the death of his father joined his brother Peter in the wine trade. He had, however, as a child a strong passion for acting, and in 1741 he joined Giffard's company at Ipswich under the name of Lyddal. At Giffard's theater in Goodman's-fields he achieved a great success as *Richard III*, and in 1742 was not less successful at Drury Lane. In 1745 he became joint manager with Mr. Sheridan of a theater in Dublin, and after a season at Covent Garden (1746) purchased Drury Lane in conjunction with Mr. Lacy, opening it 15th September, 1747, with the *Merchant of Venice*, to which Dr. Johnson furnished a prologue. From this period may be dated a comparative revival of Shakespere, and a reform both in the conduct and license of the drama. In 1763 he visited the Continent for a year and a half. He had already written his farces of *The Lying Valet*, *Lethe*, and *Miss in her Teens*; and in 1766 he composed, jointly with Colman, the excellent comedy of *The Clandestine Marriage*. After the death of Lacy, in 1773, the sole management of the theater devolved upon Garrick, until 1776, when he sold his moiety of the theater for £37,000, performed his last part, *Don Felix* in *The Wonder*, for the benefit of the theatrical fund, and bade an impressive farewell to the stage. He died in 1779, and was buried with great pomp in Westminster Abbey. Besides the pieces mentioned he wrote some epigrams, a number of prologues and epi-

logues, and a few dramatic interludes. He left a large fortune.

Garrison (gar'i-son), a body of troops stationed in a fortified place (fort, town, or castle) to defend it or keep the inhabitants in subjection.

Garrison, LINDLEY M., American cabinet officer, born in Camden, N. J., November 28, 1864. Educated at Harvard and the University of Pennsylvania. Admitted to the Philadelphia bar in 1886. Vice-chancellor of New Jersey, 1904–1913. In 1913 he entered President Wilson's cabinet as secretary of war.

Garrison, WILLIAM LLOYD, an American journalist and founder of the anti-slavery movement in the United States, born in 1805. He was apprenticed to a shoemaker, but eventually became a compositor on the *Newburyport Herald*. In 1827 he became editor of the *National Philanthropist*, the first American temperance journal. With Mr. Lundy, a Quaker, he then started in Baltimore the paper called the *Genius of Universal Emancipation* (1829), his denunciations of slave-traders leading to his imprisonment for libel. On his release he commenced lecturing in Boston, started the *Liberator* (1831), published weekly with the aid of one assistant and a negro boy. In 1832 appeared his *Thoughts on African Colonization*, and in the same year he established the American Anti-Slavery Society. He subsequently visited England, where he was welcomed by Wilberforce, Brougham, Buxton, and others. In 1835 he was saved with difficulty from a Boston mob; but his principles made steady progress until 1865, when the Anti-Slavery Society was dissolved with its work accomplished. He died at New York, 1879. A volume of sonnets (1843) and one of selections (1852) bear his name.

Garrot (gar'ot), a duck of the genus *Clangula*, of the oceanic section of the duck family, widely distributed over the temperate regions of Europe and America. They breed in the northern countries, returning to the more temperate regions in winter. The golden-eyed garrot (*C. chrysophthalmus*), and the harlequin garrot (*Clangula histrionica*) are common European species.

Garrote (gar-öt'), a mode of punishment in Spain by strangulation, the victim being placed on a stool with a post or stake (Spanish, *garrote*) behind, to which is affixed an iron collar with a screw; this collar is made to clasp the neck of the criminal, and the screw is turned until its point enters the spinal cord, where it unites with the brain, causing instantaneous death. This word, with the French spelling and pronunciation *garrotte*, has become naturalised in Great Britain and the United States as a term for a species of robbery effected by throttling the victim and stripping him while insensible.

Garrow Hills. See *Garo Hills*.

Garrulus (gar'ū-lus), a genus of insessorial birds of the crow family, containing the jays.

Garrya (gar'ri-a), a genus of opposite-leaved evergreen shrubs, natives of California, Mexico, Cuba, and Jamaica. *G. elliptica* is a handsome garden plant with long, drooping, necklace-like catkins of pale yellow flowers.

Garter (gar'ter), ORDER OF THE, the highest and most ancient order of knighthood in Great Britain. The origin of the order, though sometimes assigned to Richard I, is generally attributed to Edward III, the legend being that the Countess of Salisbury having dropped her garter while dancing, the king restored it, after putting it round his own leg, with the words, which became the motto of the order, '*Honi soit qui mal y pense*' (Shame be to him who thinks evil of it). The date of the foundation or restoration by Edward III of the order, as given by Froissart, is 1344, while other authorities, founding on the statutes of the order, assign it to 1350. The statutes of the order have been repeatedly revised, more particularly in the reigns of Henry V, Henry VIII, Edward VI, and George III—the last in 1805. Ladies are said to have been admitted up till the reign of Edward VI. The common title of the order was the Order of St. George, and it still bears this title, as well as that of the Garter. The original number of knights was twenty-six, including the sovereign, who was its permanent head; and this number is still retained, except that by a statute passed in 1786 princes of the blood are admitted as supernumerary members.

Insignia of the Garter.

The peculiar emblem of the order, the garter (5), a dark-blue ribbon edged with gold, bearing the motto and with a gold buckle and pendant, is worn on the left leg below the knee. The mantle is of blue velvet, lined with white taffeta, the surcoat and hood of crimson velvet, the hat of black velvet, with plume of white ostrich feathers, having in the center a tuft of black heron's feathers. The collar of gold (3), which consists of twenty-six pieces, each in the form of a garter, has the badge of the order, called the George (4), pendent from it. This consists of a figure of St. George on horseback fighting the dragon. The lesser George (2) is worn on a broad blue ribbon over the left shoulder. The star (1), formerly only a cross, is of silver, and consists of eight points, with the cross of St. George in the center, encircled by the garter. A star is worn by the knights on the left side when not in the dress of the order. The officers of the order are the prelate, the Bishop of Winchester; the chancellor, the Bishop of Oxford; the registrar, Dean of Windsor; the garter king of arms and the usher of the black rod. There are a dean and twelve canons, and each knight has a knight-pensioner.

Garter-fish. See *Scabbard-fish.*

Garter Snake, a non-poisonous serpent of the genus *Thamnophis*, widely distributed on the American continent from Southern Canada to Central America. It is a small reptile, a specimen a yard long and an inch in greatest diameter being considered a large one. The garter snake inhabits swamps, woods and rocky fields, and lives on worms, frogs, fish, small mammals and birds. Some species are semi-aquatic. The common color marking of the garter snake is three light-colored longitudinal stripes on a darker ground, and slate-colored ventral surface.

Gary (gar'i), an industrial city in Lake county, Indiana, founded in 1906 on the shore of Lake Michigan, a few miles S. E. of Chicago, as the seat of an immense plant of the Indiana Steel Company, an outgrowth of the U. S. Steel Corporation. It was named from Elbert H. Gary, an eminent corporation lawyer, born at Wheaton, Illinois, in 1846, and president in 1898 of the Federal Steel Company, which was merged into the U. S. Steel Corporation in 1901, of which he was made chairman of the Board of Directors. The town quickly gained a large population, amounting in 1910 to 16,802.

Gary School System, a method of literary and mechanical education which has been adopted in the industrial city of Gary, Indiana. It is a 'study, work and play school,' all provided for in the same building, in such a way that the full capacity of the school rooms, workshops, gymnasium and playground are successively occupied by the several classes. There are no fixed courses or set text-books, each child being free to select the studies and work he prefers. There is also no division into elementary and high schools, all these being in the same building and using the same school rooms, shops, etc.

Gas, an elastic aeriform fluid, a term originally synonymous with air, but afterwards restricted to such bodies as were supposed to be incapable of being reduced to a liquid or solid state. Under this supposition gas was 'a term applied to all permanently elastic fluids or airs differing from common air.' After the liquefaction of gases by Faraday, the old distinction between gas and vapor, viz., that the latter could be reduced to a liquid or solid condition by reduction of temperature and increase of pressure, while a gas could not be so altered, was no longer tenable, so that the term has resumed nearly its original signification, and designates any substance in an elastic aeriform state. *Gases* are distinguished from *liquids* by the name of *elastic* fluids; while liquids are termed *non-elastic*, because they have, comparatively, no elasticity. But the most prominent distinction is the following:—*Liquids* are compressible to a small degree, and expand into their former state when the pressure is removed; and in so far they are elastic, but *gases* appear to be in a continued state of compression, for when left unconfined they expand in every direction to an extent which has not hitherto been determined. In respect of this indefinite expansiveness, all gaseous bodies obey more or less strictly two laws, commonly called the 'gaseous laws.' The first, known as the law of Boyle and Mariotte, given first by Robert Boyle in 1662, and then by Mariotte in 1676, is that—*The volume of a given mass of gas varies inversely with the pressure to which the gas is subjected;* or, in other words, the *density* of a given mass of gas is in direct proportion to the pressure that the gas is subjected to. The second of the gaseous laws is commonly called the law of Dalton and Gay-Lussac. It is, however, properly called Charles's law. Dalton published it in 1801; but Gay-Lussac, who stated it in 1802, gives the credit of having discovered it, fifteen years previously, to

Citizen Charles. The law may be stated as follows:—*The volume of a gas maintained under constant pressure increases for equal increments of temperature by a constant fraction of its original volume;* and this fraction is the same whatever is the nature of the gas. A mass of gas, whose volume is 1000 at 0° C., becomes, at 100° C., 1366.5, the pressure remaining constant. In virtue of these laws a gas may now be defined to be a substance possessing the condition of perfect fluid elasticity, and presenting under a constant pressure a uniform state of expansion for equal increments of temperature—a property distinguishing it from vapor. There is, however, no known gas that obeys these two laws perfectly; thus of the gases whose liquefaction has been attended with most difficulty (oxygen, hydrogen, nitrogen, carbonic oxide, nitric oxide, carburetted hydrogen and helium), all except hydrogen are more compressible than they should be theoretically, while hydrogen deviates slightly in the opposite direction, being less compressible than Boyle's law would indicate. The other gases exhibit even greater deviations from Boyle's law, and the amount of the deviation rapidly increases as the gas is brought nearer and nearer to liquefaction. The law of Dalton or Charles which gives for equal elevations of temperature equal increments of volume is also deviated from by every gas, and more and more so as the point of liquefaction is approached.

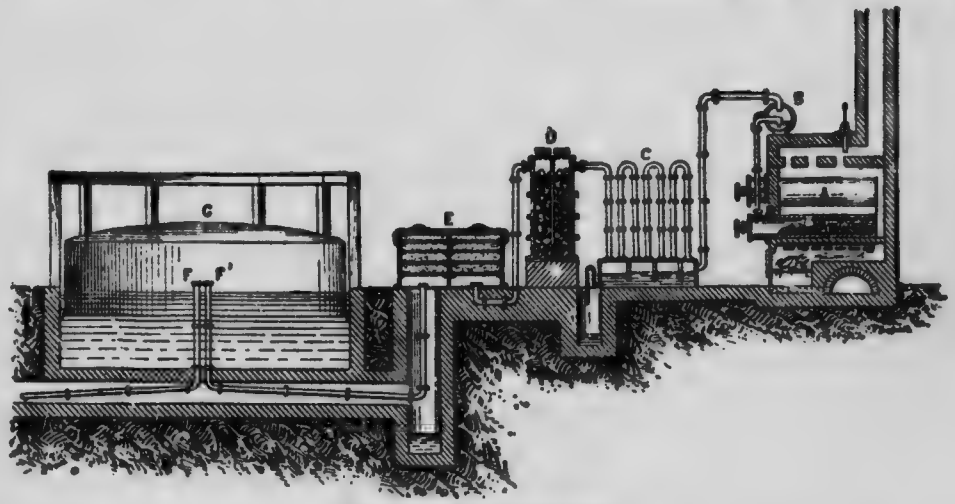
The liquefaction of gases is effected by the application of cold or pressure, or both combined. For any given pressure there is a particular temperature at which the gas liquefies. At a certain point, however, called by Andrews the *critical point of temperature*, the distinction between liquid and gas appears completely lost. At and above this temperature no pressure that can be applied will convert the fluid into the form of a liquid even though the volume is diminished by pressure so much as to make the density of the fluid greater than that of the liquid obtained at lower temperatures. By 1908 all gases had been liquefied, including the extremely rare hydrogen and helium.

The power of motion inherent in all parts of aeriform matter is accounted for by the kinetic theory of gases, according to which a gas consists of an enormous number of molecules moving about with very great velocity. Great as is their number, however, the molecules are sparsely distributed through space, in comparison with their distribution when the substance is in the solid or liquid condition. A molecule of a gas flying about moves on in a straight line till it meets another molecule, or till it impinges on a side of the containing vessel. Meeting another molecule the two turn each other aside, just as two billiard balls when they come into collision are both deflected from their previous paths. Passing thence each flies on in a straight line till it meets another molecule, and each is again deflected. When the molecules impinge on the side of the vessel that contains the gas they rebound as a billiard ball does from the cushion of the billiard table; and the perpetual shower of molecules that strike and rebound from the sides gives rise to the phenomenon of gaseous pressure, just as an umbrella held out in a hailstorm is pressed downwards owing to the numerous impulsive blows that act upon it. When the temperature of a gas is raised the energy of the molecules is increased. They strike with greater velocity, and the number of blows on the side of the vessel is also increased. The pressure is therefore greater; and the law of Dalton or Charles is easily shown to be a consequence of the kinetic theory. Boyle's law also follows very simply from it; for if we diminish the volume of the containing vessel to one-half, one-third, or to any other fraction of its original volume, we increase the number of molecules in a given space, a cubic inch for instance, in the same ratio. Consequently, the number of impacts on a square inch of the surface of the containing vessel will also be increased in the same ratio, and the pressure will thus be increased in that ratio, too. It is estimated that in a cubic centimeter of gas at standard temperature and pressure there are nineteen million million million molecules.

Gas, Lighting by, as ordinarily understood, the application of carburetted and bicarburetted hydrogen gas, that is *olefiant gas*, to the lighting of buildings, streets, etc. In 1739 the Rev. Mr. Clayton published a paper in the *Philosophical Transactions*, on the inflammable nature of the gases obtained by the decomposition of pit-coal in heated close vessels; but no practical application of this discovery was made before 1792, when Mr. W. Murdoch, a native of Ayrshire, in the employ of Messrs. Watt and Boulton, lighted his own house and offices at Redruth on this principle. In 1798 he erected a gas apparatus on a large scale at Soho Foundry, Birmingham, and in 1802 M. Le Bon lighted his house in Paris by gas, and made a proposal to supply the whole city. The introduction of gas for public lighting was,

however, strongly resisted, through fear of possible explosion, it being first tried in the streets in London in 1813. In the United States the resistance continued longer, Boston adopting it in 1822, New York in 1827 and Philadelphia in 1835. From this time coal gas became the most common illuminating agent wherever it could be prepared economically. Another kind of gas for lighting has lately come into use to some extent, namely, *water-gas*, produced from the decomposition of water in the form of steam by passing it through incandescent fuel. Gas for lighting, however, has been to a large extent superseded by electricity. See *Water-gas*.

Gas is obtained from coal, the best sorts being those bituminous coals known in England by the name of *cannel*, and in Scotland by the name of *parrot*. The coal is distilled in retorts of cast-iron (A), or now more generally of fire-clay, heated to a bright-red heat. As they issue from the retort into the hydraulic main (B) the products of distillation contain vapors of tar and naphtha, together with steam impregnated with carbonate of ammonia and hydrosulphide of ammonium. These vapors would condense in the pipes in which the gas must be distributed, and would clog them up; they must therefore be so far removed by previous cooling as to cause no inconvenient condensation at ordinary temperatures. The crude gas contains, besides, sulphuretted hydrogen, the combustion of which would exhale an offensive odor. Carbonic acid weakens the illuminating power of the gas, and has also to be removed. In the hydraulic main—a large horizontal pipe at first about half-filled with water—some separation is effected between the liquid products of distillation and the gaseous, which bubble up through the liquid into the upper portion of the main. At the end of the main the liquids fall by their greater gravity into the sunk reservoir known as the tar-well, while the gas is conducted to the condenser or refrigerator (C), a series of bent iron tubes kept cool either by exposure to currents of air or by allowing water to flow over them. In these there is a further deposit of tar and water, and the gas passes on to the washer, a series of cells in which the gas is forced through water or exposed to water spray for the removal of ammonia. The scrubber (D), which is sometimes used in place of the



Gas-work, shown in Section.

washer, is a large chamber filled with coke kept constantly wet with sprays of water. The gas in passing up the scrubber leaves its last traces of ammonia and its compounds, and then enters the purifiers (E), which are iron chambers containing a series of perforated trays on which are spread slaked lime (in the form of dry hydrate), or a mixture of sawdust and oxide of iron. These remove carbonic acid and the greater portion of the sulphur compounds, and the gas is then conveyed by means of a pipe (F') to the gas-holder (G), a storehouse or reservoir, in which it is subjected to uniform pressure, and from which it is discharged (F) into the street or other mains in the constant stream necessary to produce a steady flame from the burners in the houses of those using it. The

gas-holder, sometimes called a *gasometer*, is usually a very large cylindrical air-tight structure of iron plates, closed at top, open below, and having the lower end immersed in a water reservoir. It is supported by chains passing over pulleys on iron columns, the greater part of the weight of the gas-holder being counterbalanced by weights attached to the chains, so that it can exercise a certain regulated pressure on the gas contained in it.

The quantity of gas consumed by each consumer is measured by an instrument called a meter, of which there are two classes—the wet and the dry. The wet meter is composed of an outer box about three-fifths filled with water. Within this is a revolving four-chambered drum, each chamber being capable of containing a definite quantity of gas, which is admitted through a pipe in the center of the meter, and, owing to the arrangement of the partitions of the chambers, causes the drum to maintain a constant revolution. This sets in motion a train of wheels carrying the hands over the dials which mark the quantity of gas consumed. The dry meter consists of two or three chambers, each divided by a flexible partition or diaphragm, by the motion of which the capacity on one side is diminished while that on the other is increased. By means of slide-valves, like those of a steam engine, worked by the movement of the diaphragms, the gas to be measured passes alternately in and out of each space. The contractions and expansions set in motion the clockwork which marks the rate of consumption. The diaphragms in all the chambers are so connected that they move in concert.

The profitable consumption of gas, whereby the strongest light can be had at the least expenditure of gas, depends considerably upon the form of the burner, and the mode by which the flame is fed with the air necessary for its combustion. There must be a sufficient supply of oxygen to convert the carbon of the gas into carbonic acid, and the hydrogen into water. If oxygen is lacking, the flame will be smoky from excess of carbon. In this case the remedy is either to reduce the supply of gas or increase the supply of air. This may be effected by modifying the form of the burner, or in the case of the Argand burner by having a different shape of glass chimney. As to the form of the burner, it has been found that a plain jet ¼ inch in diameter at the orifice, will not give a flame free from smoke of a greater height than 2½ inches; but the same quantity of gas which would give a smoky flame from a plain jet, will produce a clear bright flame by extending or dividing the aperture of the jet so as to expose larger surface of flame to the atmosphere. It is not, however, necessary to increase the superficial area of the flame; it may even be diminished with a more intensely luminous effect by having instead of one aperture two small ones placed at an angle to each other, so that the jets may cross each other. This forms the union jet. Another form is the slit or batwing burner, in which a clean slit is cut across the top of the beak. In the Argand burner a circle of small holes supplies the gas, and a current of air is admitted through the center of the flame, which is steadied and considerably increased in brilliancy by being surrounded by a glass chimney. For the lighting of large halls an improvement called the sun-light has been introduced. This consists of rings of union jets. The incandescent gas light is produced by the heat from a bunsen burner making incandescent a fragile *mantle* of certain rare metals of great resisting powers to heat, which yield an intense light when heated. This is known as the Welsbach light. See *Natural gas*, *Producer gas*, *Acetylene gas*.

Gascoigne (gas-koin'), George, an English poet, born in 1535, educated at Cambridge, admitted to Gray's Inn in 1555. Being disinherited by his father, he served with distinction in Holland and was made prisoner by the Spaniards, but returned safely to England, and died at Stamford in 1577. He is chiefly remembered for his blank-verse satire, *The Steele Glas* (1576), and the *Complaynt of Philomene*, a rhyming elegy (1576), but he wrote two or three comedies and tragedies.

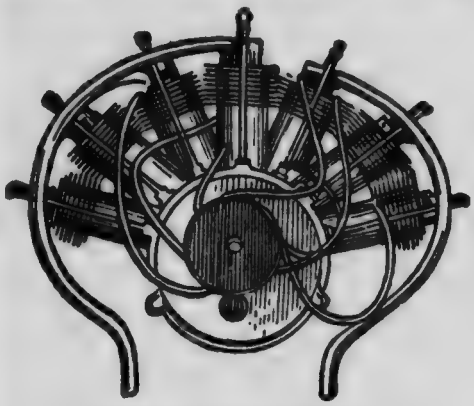
Gascoigne, Sir William, an English judge of the Court of King's Bench, born about 1350; died in 1419. He is chiefly famous for directing the imprisonment of the Prince of Wales (afterwards Henry V), who had struck him in open court for condemning one of his dissolute friends. He also declined to obey the king and sentence Archbishop Scroop to death, alleging that the law gave him no power over the life of an ecclesiastic. In each case the king ultimately approved his action.

Gascony (gas'kō-ni), an old division of France, between the Garonne, the sea, and the Pyrenees. It composes the departments of Hautes Pyrénées, Gers, and Landes, with part of those of Bas Pyrénées, Haute Garonne, Lot-et-Garonne, and Tarn-et-Garonne. The Gascons, who are of mixed Basque and Gothic descent, used to have

Gas Engine

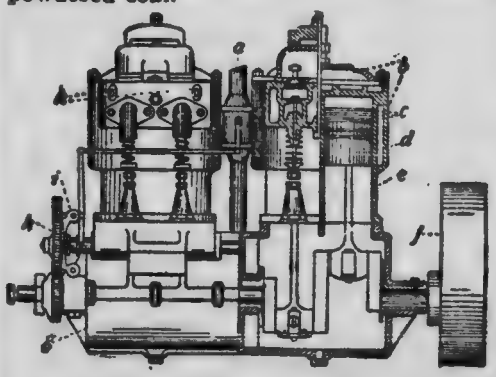
the character of being brave, faithful, and peculiarly tenacious of purpose, but much given to boasting, whence the word *gasconade*.

Gas Engine, The term 'gas engine' is now generally used to cover all types of heat engines in which the power is derived from the combustion of a mixture of air with a gaseous, liquid or pulverized solid fuel, *within* the



R. E. P. Aeroplane Motor.

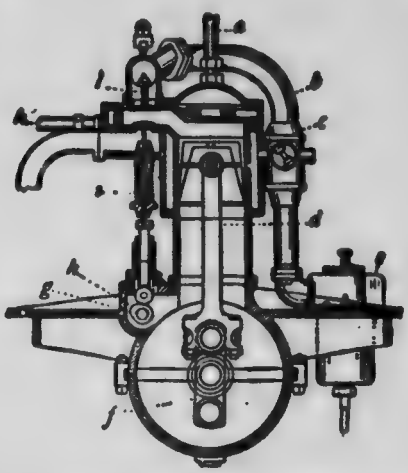
cylinder of the engine. The term 'internal combustion engine' is also properly applied to this class to distinguish it from steam or hot air engines, where the heat which energizes the working substance, such as steam or air, is generated in an external furnace. The fuels most commonly used in gas engines are coal gas, water gas, natural gas, producer gas, blast furnace gas, gasoline, naptha benzine, kerosene, fuel oil, crude petroleum, alcohol, oil tar, and in some instances powdered coal.



INTERNAL-COMBUSTION ENGINE (SIDE VIEW).

a, inlet for fuel mixture; *b*, water-jacket; *c*, piston rings; *d*, piston; *e*, cylinder; *f*, fly-wheel; *g*, crank-case; *h*, half-time gear; *i*, governor; *k*, holes for spark-plugs.

The earliest gas engines, which attempted to use the explosive force of gunpowder, were made by Huyghens in 1670



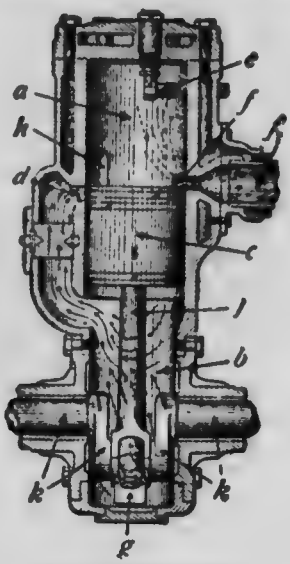
INTERNAL-COMBUSTION ENGINE (SECTIONAL VIEW).

a, water-outlet; *b*, vapor-pipe; *c*, throttle-valve; *d*, connecting-rod; *e*, carburetor; *f*, crank-shaft; *g*, cam-shaft; *h*, cam; *i*, exhaust-valve; *k*, water-inlet; *l*, induction-valve.

and Abbé Hautefeuille in 1682. In 1791 John Barker patented in England a gas turbine, and in 1794 Robert Street patented an oil engine in which the oil was first evaporated in the cylinder and then ignited. Following Lebon's design of 1799, several experimental engines for coal gas were developed between 1823 and 1842, but it was not until 1860 that a commercial engine was built by Lenoir. In this engine the gas and air were drawn into the cylinder in the first portion of the stroke; the slide valve then closed and the charge was ignited. Many Lenoir engines were used, in spite of the high gas consumption of 100 cubic feet per horse-power hour.

In Otto and Langen's 'free piston' engine of 1867 the weighted piston flew upward after the explosion, and turned the shaft on the return stroke by means of a ratchet gear. The consumption of gas was about 57 cubic feet per horse-power hour, but the engine was very noisy. In 1876 Dr. Otto brought out the first engine of the 'four-cycle' type, working on a principle suggested independently by Beau de Rochas in 1862. This is literally a 'four-stroke-cycle,' requiring two revolutions of the crank-shaft per power stroke, as follows: 1-out stroke, suction of charge; 2-return-stroke, compression of charge; 3-out stroke, explosion or power stroke; 4-

return stroke, exhaust and scavenging. The inlet valve is open on the first stroke, and the exhaust valve on the fourth. The compression of the gas before ignition gave much greater economy,



TWO CYCLE ENGINE.

a, working-end of cylinder; *b*, enclosed crank-case filled with slightly compressed aspirated and combustible mixture of air and gasified fuel; *c*, working-piston; *d*, inlet-port for mixture from crank-case; *e*, igniter, or spark-plug; *f*, *f*, exhaust-port and -pipe; *g*, inlet for air and fuel; *h*, deflector to prevent inlet mixture from crossing over to exhaust-port before the piston has closed the latter on its return stroke; *j*, connecting-rod; *k*, crank and crank-shaft.

reducing the consumption to 20 cu. ft. per horse-power hour. In 1881 Clerk devised a two-cycle engine, receiving an impulse every revolution, in which the exhaust took place at the outer end of the first stroke, and the fresh charge was at once pushed in by a separate 'displacer piston' or pump. Modern two-cycle engines of small sizes make use of a closed crank case instead of the displacer cylinder. The first successful American engine was the Brayton in 1873.

Six-cycle engines, compound engines and a four-cycle engine with alternate strokes of different lengths have been built, as also various types of gas turbines.

The Lenoir engine was double-acting. The first Otto engine was single-acting, *i.e.* received impulses only on one side of the piston, and while two- and four-cycle engines are now made both single- and double-acting, by far the commonest type being the single-acting, with a long trunk piston.

In 1893 Dr. Rudolf Diesel patented an engine in which air alone was compressed to a pressure of about 500 lbs. per sq. in., reaching a temperature of about 1000° F. The fuel was then injected into the cylinder in the form of a spray, and ignited spontaneously in the heated air. The efficiency of the Diesel engine is high; it can use low grades of fuel, but has the disadvantage of greater weight per horse-power. Diesel engines are made both 2- and 4-cycle, single- and double acting. One of the most interesting modern developments of the gas engine is the growing use of Diesel engines for marine propulsion.

Gas engines require that their cylinders shall be cooled. In small engines, and in some automobile and most aeronautic motors, air cooling is accomplished by providing the cylinders with radiating flanges, fins or pins, and a fan is generally employed. In most stationary engines, a water jacket is used. In automobiles the water is circulated by a pump or by thermal syphon, cooled in a radiator and used over. In some engines the water is simply allowed to boil, and the latent heat or evaporation absorbs the heat from the cylinder.

Ignition of the charge is most commonly effected by an electric spark, or by a hot tube or flame uncovered at the proper instant. The two general types of electric ignition are the jump-spark or high tension, and the make-and-break spark, or low tension.

Engines using fixed gases are arranged either with a mixing valve for proportioning the air and gas, or with separate inlet valves for each. Engines using volatile hydrocarbons, as gasoline, benzine, alcohol, etc., are equipped with some form of carburetor for vaporizing the liquid and mixing it with the entering air. With kerosene and heavier oils some form of pre-heating or volatilization is commonly practiced, or else the oil is injected into the cylinder. Some engines will run on kerosene if started first on a more volatile oil. Heavy tars and even powdered coal can be injected into the cylinder.

The valves of the gas engine were at first of the flat slide type, but higher pressures brought the general use of the mushroom-shaped poppet-valve actuated by a cam-shaft. A modern development is the cylindrical sleeve type, consisting of one or two sleeves riding concentrically on the cylinder and actuated by eccentrics. A great advantage in the elimination of noise and wear is claimed

for this form. In two-cycle engines, so called 'valveless,' the valves take the form of ports uncovered by the piston in its travel.

Gas-engine governors are divided into two general classes, the throttling type which varies the quantity of the explosive mixture admitted to the cylinder, and the "hit or miss" which varies the frequency of the impulse strokes by omitting to ignite the charge in the cylinder whenever the engine rises above a certain given speed.

The various types of engines have all been tried in different fields, but some idea of the commoner tendencies are here given:

Stationary engines—smaller powers, mostly 4-cycle horizontal, single-cylinder, and vertical one- to four-cylinder, single acting.

Stationary engines—large powers, horizontal, double-acting, frequently two-cycle. Built in all sizes up to 6,000 horsepower.

Portable engines—small two- and four-cycle gasoline engines, one- and two-cylinder, vertical and horizontal, single-acting.

Automobile engines—mostly four-, six- and eight-cylinder, vertical four-cycle, single-acting engines; a few two-cycle.

Marine engines—small, for motor boats, one- to six-cylinder like automobile, but with t 'o-cycle engines common.

Marine engines—large, mostly Diesel, two- and four-cycle, single- and double-acting. Producer-gas engines have been tried on ships.

Aeronautic engines—similar to automobile engines, but wonderfully lightened; also multi-cylinder, V-shaped engines and revolving-cylinder engines. Two- and four-cycle.

The great advantages of gas engines over steam are the absence of boilers, coal and ashes, and the higher efficiencies obtainable. Small engines using city gas are more economical than similar-sized steam plants. Large steam plants produce power for lower cost than city gas, but can be equalled or bettered by producer gas and by some types of oil engines. Modern producer-gas units consume less than 1¼ lbs. of coal per horse-power hour. A Diesel engine will develop a horse-power hour on ½ lb. of Texas petroleum. A consumption of 1 pint of gasoline per horse-power hour is good practice for well-designed automobile engines. With other forms of fuel the efficiency varies with the type of engine and grade of fuel, but the total efficiency of well-designed gas engines ranges from 10% to 35% of the energy available in the fuel, as against 1% to 20% for steam practice.

Gaskill (gas'kil), ELIZABETH CLEGHORN, an English novelist born at Chelsea, England in 1810; died in 1865. In 1832 she married William Gaskill, a Unitarian minister. *Mary Barton* (1848), a novel of factory life brought her fame. This was followed by many others, including the well-known *Cranford*.

Gas Mantles, known commonly as Welsbach mantles, used with a Welsbach burner, are manufactured as follows: A textile form is knitted of cotton, ramie or silk, and this form is then saturated in a bath containing 60 per cent. thorium nitrate and 2 per cent. cerium nitrate. The textile form is then subjected to a hot flame which burns away the textile fabric and converts the partially fused earths into oxides. In this condition the mantles are exceedingly fragile. To impart to them the necessary body to permit of handling and transportation they are dipped in collodion. This collodion is what burns away when the mantle is first lighted after being put in place on the burner.

Gasoline (gas'o-lēn), a highly volatile, inflammable compound of fluid hydrocarbons, resulting from the distillation of crude petroleum or coal. It is used in carbonizing water gas and as fuel in vapor stoves, lamps and in gas engines for automobiles and other purposes.

Gasoline-Electric. A gasoline-electric road train was introduced in Germany in 1913. It comprises a power car and ten trailers each of 5 tons capacity. The power car carries the generator set, viz., two Daimler motors of 125 horsepower each, driving a dynamo installed in the center. The current is transmitted to the electric motors, actuating each of the wheels of the power car and trailers.

Gasoline Engine or GASOLINE MOTOR. See *Gas Engine*.

Gaspé (gäs-pā), a district of Canada, prov. Quebec, on the south of the St. Lawrence estuary, washed by the Gulf of St. Lawrence, of which Gaspé Bay is an inlet. The fisheries are valuable. Gaspé Basin is a port on Gaspé Bay.

Gassendi (gas-sen'dē; properly GASSEND), PIERRE, a French philosopher and mathematician, born in 1592; died in 1655. His *Exercitationes Paradoxicæ adversus Aristotelem* (1624), while they gave great offense to the

Aristotelians, obtained him a canonry in the cathedral of Digne; but a second book of *Exercitationes* excited so much enmity that he ceased all direct attacks on Aristotle. He strenuously maintained the atomic theory, in opposition to the views of the Cartesians. His later works are *De Vita, Moribus et Doctrina Epicuri* (1647), *Syntagma Philosophiæ Epicuri* (1649), and lives of Tycho Brahe, Copernicus, Peurbach, and Regiomontanus (John Müller).

Gas-Stove, a stove which uses inflammable gas as a means of heating and cooking. Sheet-iron stoves of various patterns are used for this purpose, others take the form of logs of terra-cotta, pierced with holes for the outflow of the gas.

Gastein (gäs'tīn), or WILDBAD GASTEIN, a watering-place in Austria, 3000 feet above the sea, 48 miles south of Salzburg, with thermal springs (64° to 100°) containing salt and carbonates of magnesia and lime. It gives the name to a treaty signed here in 1865 by the Emperor of Austria and the King of Prussia, the non-observance of which led to the German war of 1866.

Gasteromycetes (gas-tĕr-ō-mi-sē'tes). See *Fungi.*

Gaston de Foix (gäs-ton de fwä), Duke of Nemours, a French soldier, born in 1489, son of John de Foix, Count d'Estampes, and Mary of Orleans, sister of Louis XII. whose favorite he became. At the age of twenty-three he routed a Swiss army, rapidly crossed four rivers, drove the pope from Bologna, and won the celebrated battle of Ravenna (1512), but was killed while attempting to cut off a body of retreating Spaniards.

Gastonia (gas-tō'ni-a), a town in Gaston Co., North Carolina, 22 miles W. of Charlotte. It has cotton mills, shirt factory, tannery, etc., and a large shipping business in cotton yarns and cloth. Pop. 5759.

Gastornis (gas-tôr'nis), a large fossil bird of more than one species, remains of which have been discovered in the lower Eocene deposits of Meudon, near Paris, and elsewhere. The bones indicate a bird as tall as the ostrich, and its structural peculiarities point to affinities with the Grallatores or wading-birds.

Gastralgia (gas-tral-gi-a), a severe pain in the stomach, generally arising from indigestion.

Gastræa See *Gastrula.*

Gastric Juice (gas'-trik jūs), a clear colorless fluid with an acid taste and sour odor secreted by the mucous membrane of the stomach, and chief agent in the process of digestion. It is acid, and contains pepsin, its essential nitrogenous principle. The activity of the fluid has been ascribed to various acids present, lactic, acetic, and butyric, but it appears that free hydrochloric acid is that which is secreted by the stomach, the others being the products of change of food undergoing digestion. The acid is necessary for the pepsin to exercise its properties, which are limited to the conversion of nitrogenous substances into *peptones,* fatty matters not being affected by it. (See *Pepsin.*) Gastric juice also holds in solution various inorganic salts, chiefly chlorides and phosphates, occasionally also abnormal substances such as urea, ammonia, salts, and biliary acids. It is not possessed of any marked reactions with ordinary chemical reagents, does not become turbid by boiling, and gives no striking precipitates with acids, alkalies, or mineral salts. The amount secreted daily in the human adult is estimated to be about 14 pounds, but as it is continually reabsorbed, there is no great quantity present at any one time.

Gastric System, all the parts of the body which contribute to digestion.

Gastritis (gas-trī'tis), or GASTRO-ENTERITIS. See *Enteritis.*

Gastrochaena (gas-trō-kē'na), a genus of boring bivalves (*Gastrochænidæ*), which also includes the remarkable Aspergillum and Clavagella. The original shell has the two valves typical of Lamellibranchs; but these are delicate, and become surrounded by a secondary tubular shell lining the cavity which the mollusc bores into limestone, coral, and other shells.

Gastrocnemius (gas-trok-ne'mi-us), the most external of three superficial muscles forming the calf of the leg and terminating above the heel in the *tendo Achillis.*

Gastrolobium (gas-tro-lō'bi-um), a large genus of leguminous plants occurring in Southwestern Australia. Several of the species often prove fatal to cattle, and they are hence known as poison-plants.

Gastromalacia (gas'tru-ma-lā'si-a), softening of the stomach, a disease occurring in infants.

Gastropods (gas-trō'pods), or GASTEROPODS, a class of molluscs, consisting of animals usually inhabiting a univalve shell. The distinguishing characteristic is the foot, which is broad, muscular and disc-like, attached

to the ventral surface. The class is divided into two sub-classes the Branchiata or Branchiogastropoda, breathing water by gills, and the Pulmonata or Pulmogastropoda, breathing air by a sort of lung apparatus. The former include whelks and periwinkles, etc.; the latter include land-snails, slugs, pond-snails, etc.

Gastrostomy (gas-tros'to-mi), the operation of forming an artificial opening into the stomach with the view of introducing food when it cannot be received naturally on account of obstruction or stricture of the gullet.

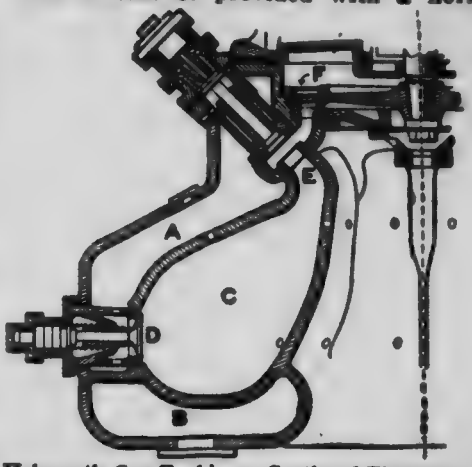
Gastrotomy (gas-trot'o-mi), in surgery, the operation of making an incision in the stomach to remove a diseased part of foreign body.

Gastrula (gas'troo-la) or GASTRAEA, the name applied by Haeckel to a thimble-shaped larva which appears in the life history of many different kinds of organisms. Such a larva, as it occurs in an annelid, or in the simple vertebrate amphioxus, consists of an outer layer of cells, or ectoderm, and an inner or endoderm. The inner layer lines the gastral cavity, which communicates with the interior by an opening called the blastopore. The gastrula itself arises from a blastosphere, or hollow ball of cells, by the folding in of the cells at one point, as a thimble might be made by pushing in one side of a hollow ball. The outer and the inner layer of cells of the gastrula always give rise to definite organs of the future animal.

Gas Turbine, a turbine engine operating by the energy of exploded gases, first invented by Réné Armengaud in France, in 1906. Gas turbines are now of two types, the constant pressure and the explosion. The Armengaud engine is of the former type. The gas and air are compressed separately and the mixture admitted in a constant stream into a combustion chamber, where it is ignited by an incandescent platinum wire. The largest engine of this type ever produced was only 300 horsepower, and the death of the inventor left it unperfected.

Of the explosion type the Holzwarth turbine is the most efficient. In this the combustion chamber is intermittently filled with a mixture of gas and air admitted at the base of the machine. Ignition, explosion and increase in pressure of the burnt gases and their expansion through a nozzle result, after which the gases act on a horizontal turbine wheel. There are five or ten similar explosion chambers arranged in a circle at the base of the turbine, and these act one after the other or in series. When the combustion chamber has been filled with compressed air, compressed gas is driven in, while the nozzle valve remains closed. When the gas is ignited the valve is forced open and the pressure of the gases is transformed into kinetic energy. After each explosion the chamber is cleared and cooled by fresh air.

The turbine is provided with a horizontal governor shaft driven by a screw gearing. To this shaft are keyed the main governor, the emergency governor for preventing ignition, a tachometer, the ignition mechanism and the gear for operating a vertical oil distributor.



Holzwarth Gas Turbine.—Sectional Elevation.

A, compressed air chamber. B, compressed gas chamber. C, combustion chamber. D, valve admitting compressed air to combustion chamber. E, nozzle valve admitting exploding gas to rim of motor F.

Gates (gāts), HORATIO, an American soldier, born in England in 1728. At the capture of Martinique he was aide-de-camp to General Monkton, and he was with Braddock when the latter was defeated in 1755. On the conclusion of peace he purchased an estate in Virginia, on which he resided until the Revolutionary war in 1775. He was at the head of the American army of the north when the British general Burgoyne was forced to surrender his whole army at Saratoga (1777), though most of the credit for this victory belonged to the preceding commander, General Schuyler. In 1780, after the capture of General Lincoln by Clinton, at Charleston, Gates received the chief command of the southern districts, but was badly defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and brought to court-

martial, but was finally acquitted, and reinstated in his command in 1782 after the capture of Cornwallis. He then retired to Virginia, and in 1790, having emancipated all his slaves, he removed to New York, where he died in 1806.

Gates, MERRILL EDWARDS, educator, born at Warsaw, New York, in 1848. He was principal of the Albany Academy, 1870-82, president of Rutgers College, 1882-90, and of Amherst College, 1890-99, and a Congregational minister after 1890. He wrote *International Arbitration, Highest Use of Wealth; Sidney Lanier, Poet and Artist*, etc.

Gateshead, a parliamentary and municipal borough of England, County Durham, on the right bank of the Tyne, opposite Newcastle, of which it is practically part, being connected with it by three bridges. The industrial establishments include works where heavy articles in iron, such as girders, anchors, and chain cables, as well as engines, etc., are made; shipbuilding yards, roperies, brass, copper, and iron foundries, paper, glue, vinegar, glass, artificial manure, and large chemical works. In the vicinity are quarries from which the celebrated 'Newcastle grindstones' are obtained, and numerous collieries. Pop. (1911) 116,928.

Gath (Hebrew, 'wine-press'), one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines. It was the native town of Goliath, and was successively captured by David, Hazael, and Uzziah, who dismantled it. The site cannot be determined with certainty, but it is sometimes identified with Tell-es-Safieh, between Ekron and Ashdod.

Gatineau (gat-i-nō'), a river of Canada, Quebec province, the largest affluent of the Ottawa, rising in some lakes, and flowing almost due south to enter the Ottawa nearly opposite Ottawa city. It is not navigable more than five miles above the Ottawa except by canoes, but its rapid waters are well stocked with fish, and available as waterpower. The country through which it flows is, however, only partially settled.

Gatling (gat'ling), RICHARD JORDAN, inventor, born in Hertford County, North Carolina, in 1818; died in 1903. He studied medicine, but never practiced, removing eventually to Hartford, Connecticut, where he invented several ingenious machines, the most important being the machine gun which bears his name.

Gatling-gun. See *Machine-gun.*

Gatshina, GATCHINA (gat-chi'na), a town of Russia, government of, and 35 miles S. S. W. of St. Petersburg, on a small lake. It is regularly built, and contains one of the finest of the imperial palaces of Russia. Pop. 14,735.

Gau (gou), a German word of doubtful origin, meaning in general district, but in a special sense a district as a political unit and its inhabitants as a political association. It formed a sort of middle division between the highest unit, the state, and the lowest, the village, corresponding in some respects to the 'hundred.' The freemen of the Gau met at certain periods, under an elected head, to settle matters relating to the public weal; and in the same way the head men of the Gauen met to settle matters relating to the state at large. In the Frankish Empire the character of the Gau was altered, each Gau now having as its head one or more royal officers called grafs or counts. These countships became hereditary, and about the twelfth century the Gau ceased to exist as a political division, though the name has survived in Aargau, Thurgau, etc.

Gauchos (gä-ch'chōs), natives of the pampas of the La Plata countries in South America, of Spanish descent. The race is noted for their spirit of wild independence, for horsemanship, and the use of the lasso. Their mode of life is rude and uncivilized, and they depend for subsistence chiefly on cattle-rearing.

Gauge, GAGE (gāj), STEAM AND WATER, the instruments fixed to engine boilers for registering the force of steam and the level of the water. The first often consists of a siphon tube, with equal legs, half-filled with mercury. One end is fastened into a pipe, which enters that part of the boiler which contains the steam; the other end is open to the atmosphere. The steam, acting on the mercury in one leg of the gauge, presses it down, and the mercury in the other leg rises, the difference between the two columns being the height of mercury which corresponds to the excess of the pressure of the steam in the boiler above the pressure of the atmosphere; or, in other words, to the effective pressure on the safety-valve. For high-pressure engines the steam-gauge usually consists of a spiral tube into which the steam is admitted, and which becomes less bent the greater the pressure. The water-gauge is a vertical glass tube, or flat

case, communicating above and below with the boiler. Gauge-cocks are sometimes put instead of or in addition to the tubes, for enabling the engineer to verify the level of the water.

Gauge, a standard of measurement. As applied to railways, gauge signifies the distance between the centers of each pair of rails, which in the ordinary gauge used in the United States is 4 feet 8½ inches. The broad gauge, as in the Great Western Railway of England, is 7 feet; the Irish, Indian, and Spanish gauge is 5 feet 6 inches. Special narrow gauges have recently been adopted for mountain and mineral lines, such as the 3 feet 6 inch gauge of the Norwegian lines. Gauge is also the name applied to various contrivances for measuring any special dimension, such as the wire gauge, an oblong plate of steel, with notches of different widths cut on the edge and numbered, the size of the wire being determined by trying it in the different notches until one is found which it exactly fits. The thickness of sheet-metal is tried by a similar gauge.

Gaul (gal), GALLIA, in ancient geography, the country of the Gauls, the chief branch of the original stock of Celts. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina. Later the former was regarded quite as part of Italy, and the name Gallia was restricted to Transalpine Gaul, or the country nearly corresponding to modern France. Julius Cæsar, about the middle of the first century B.C., found Transalpine Gaul divided into three parts: 1. Aquitania, extending from the Pyrenees to the Garonne, chiefly occupied by Iberian tribes; 2. Gallia Celtica, Celtic Gaul, from the Garonne to the Seine and Marne; 3. Gallia Belgica, Belgic Gaul, in the north, extending to the Rhine.

Migrations among the Gauls about 397 B.C., and their passage of the Alps, first bring the Gallic nation into the region of history. Having crossed the Alps they fell upon the Etruscans, defeated the Romans at Allia (390 B.C.), and sacked and burned Rome, the capitol, however, being saved by Camillus. More than a century after the burning of Rome, the eastern Gauls, in 280-278 B.C., made three destructive irruptions into Macedonia and Greece. Several tribes pursued their course into Asia Minor, where, under the name of *Galatians*, they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube, and in the south of Germany disappeared. Tribes of German origin occupied the whole country as far as the Rhine, and even beyond that river. The Belgæ, who were partly German, occupied the northern part of Gaul, from the Seine and Marne to the British Channel and the Rhine, from whence colonists passed over into Britain, and settled on the coast districts. The Celts in Gaul had attained some degree of cultivation by intercourse with the Greeks and Carthaginians before they came in contact with the Romans. Those of Cisalpine Gaul continued formidable to Rome until after the First Punic war, when the nation was compelled, as the result of a war of six years, to submit to the Romans (220 B.C.). When Hannibal marched on Rome they attempted to shake off the yoke; but the Romans, victorious over the Carthaginians, reduced them again to submission. Thirty-one years later (189 B.C.) their kindred tribe in Asia, the Galatians, met with the same fate; they also were vanquished, and their princes (tetrarchs) became tributary. In the years 128-122 B.C. the Romans conquered the southern part of Gaul along the sea from the Alps to the Pyrenees, and here established their dominion in what was called the Province (Provincia), a name that still exists as Provence. Not long after Gaulish tribes shared in the destructive incursions of the Cimbri and Teutones on the Roman territory, which were ended by Marius in the battles of Aquæ Sextiæ (Aix) in 102, and Vercelli in 101 B.C. On the appointment of Julius Cæsar to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul, and executed his purpose in less than nine years (58-50 B.C.), in eight bloody campaigns. The dominion of the Romans in Gaul was confined by colonies, and the liberal grant of the Roman citizenship to several Gallic tribes. The religion of the Druids, being suppressed in Gaul by Tiberius and Claudius, gradually retreated into Britain, soon also conquered by the Romans. After the extinction of the Cæsars, the Gauls once more attempted to recover their liberty by aid of the Germans, but after this last effort became entirely Romanized, even their ancient language, the Celtic, being supplanted by a corrupt Latin dialect. About the year 486 the Franks subdued the greater part of Gaul, and put a period to the dominion of the Romans in that country. See *France*.

Gault (galt), in geology, a series of stiff marls or calcareous clays,

varying in color from a light gray to a dark blue, occurring between the Upper and Lower Greensands of the Chalk formation of England. It is developed chiefly in the neighborhood of Folkestone (hence called *Folkestone marl*), and in Cambridgeshire.

Gaultheria (gâl-thē'ri-ä), a genus of American shrubs belonging to the order Ericaceæ. It is widely distributed in North America. *G. procumbens*, the well-known wintergreen plant, is a creeper bearing white flowers, and in the fall edible red berries.

Gauntlet, or GANTLET (gant'let, gant'let), a glove made originally of chain-mail, later of plate and jointed at the fingers, used as part of the armor of a warrior in former times.

Gaur, or GOUR (gour), a ruined city in Hindustan, 60 miles north by west of Murshedabad. Once the capital of Bengal, extending about 7 miles along the old Ganges. Several villages now stand on the site of the city.

Gaur, GOUR, one of the largest of all the ox tribe (*Bos gaurus* or *Bibos gaurus*), inhabitating the mountain jungles of India, remarkable for the extraordinary elevation of its spinal ridge, the absence of a dewlap, and its white 'stockings,' which reach above the knee. It is so fierce when roused that neither tiger, rhinoceros, nor elephant dare attack it. The hide on the shoulders and hindquarters is sometimes nearly 2 inches in thickness even after being dried, and is therefore much valued for the purpose of being manufactured into shields. The animal is supposed to be incapable of domestication.

Gauss (gous), KARL FRIEDRICH, a German mathematician, born 1777. In 1801 he published his *Disquisitiones Arithmeticæ*, treating of indeterminate analysis or transcendental arithmetic, and containing, in addition to many new theorems, a demonstration of the theorem of Fermat concerning triangular numbers. He also calculated, by a new method, the orbit of the planets Ceres and Pallas. In 1807 he became professor of mathematics and director of the observatory at Göttingen, a position which he held till his death in 1855. He was pronounced by Laplace to be the greatest mathematician in Europe. His chief works were the *Theorio Motus Corporum Cœlestium* (1809), *Intensitas Vis Magneticæ Terrestris* (1833), *Dioptrische Untersuchungen* (1841), and *Untersuchungen über Gegenstände der höheren Geodesie* (1844).

Gaut. See *Ghâts.*

Gautama (gâ'ta-ma), a name of Buddha, the founder of Buddhism. See *Buddha.*

Gautier (gō-ti-ā), THÉOPHILE, a French poet and critic, born in 1811 at Tarbes (Hautes-Pyrénées). He studied painting under Rioult for two years, but gave up the brush for the pen, threw himself vigorously into the Romanticist movement, published a volume of poems in 1830, and for several years worked at general literary criticism. In 1832 appeared his poem *Albertus;* but his first great success was the romance *Mademoiselle de Maupin*, which led to his engagement by Balzac as secretary. He was afterwards engaged as theatrical and art critic on the *Revue de Paris*, the *Artiste*, the *Moniteur*, and the *Journal Officiel*. Owing to his connection with the *Journal Officiel* his fortunes became linked in some measure with those of the Bonaparte family, and he was appointed librarian to the Princess Mathilde. In 1872 he was sent by the republican government on a literary mission to Italy, and died in the same year. Among the most interesting of his productions may be ranked his *Voyages en Espagne* (1843), his *Italia* (1852), *Caprices et Zigzags* (1845), and *Constantinople* (1854), narratives of his travels; his *Roman de la Momie* (1856), *Le Capitaine Fracasse* (1863), *Belle Jenny* (1865), *Spirite* (1866), novels, together with the brilliant short stories, *Fortunio*, *Une Nuit de Cléopâtre*, *Jean et Jeanette*, *Le Roi Candaule*, etc.; and his *Histoire de l'Art Dramatique en France depuis Vingt-cinq Ans* (1849), *Les Beaux Arts en Europe* (1852), etc.

Gauze (gaz), a thin transparent stuff of silk, linen, or cotton. It is either plain or figured, the latter being sometimes worked with flowers of silver or gold.

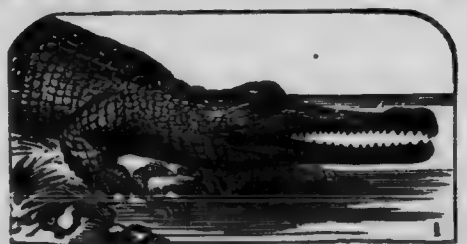
Gavarni (gâ-vâr'nē), the assumed name of SULPICE PAUL CHEVALIER, a French caricaturist, born at Paris in 1801. Originally a mechanical draughtsman, he began his artistic career in 1835 by designing costumes for theaters and journals of fashion. He then established *Les Gens du Monde;* but the journal was a failure, and the artist spent some time in the debtor's prison of Clichy. On his release he was employed upon the *Charivari*, the success of which was due in great part to his genius. His best known works are *Les Enfants Terribles*, *Les Rêves*, *Les Fourberies de Femmes*, and *Impressions de Ménages*. In 1847 he visited England, and the sketches which he sent from St.

Giles, London, to *L'Illustration* created an immense sensation. He afterwards illustrated Eugene Sue's *Wandering Jew*, Balzac's novels, and other works. He died in 1866.

Gavazzi (gä-vät'sē), ALESSANDRO, a popular Italian preacher and political agitator, born at Bologna 1809; died at Rome 1889. At the age of fifteen he became a monk of the Barnabite order, at twenty he was professor of rhetoric in the College of Naples, and soon after made his mark as a pulpit orator. In 1846 he was chaplain general of the Roman patriotic league. Subsequently he threw off his papal allegiance and joined the agitation which ended in the short-lived republic. The French occupation of Rome drove him into exile, when he traveled through Britain and America lecturing against the Church of Rome, his power as an orator evoking much enthusiasm. He was with Garibaldi in 1860, and made subsequent visits to Britain gathering funds for the Free Italian Church, in the interests of which he lectured, preached, and traveled on deputation work till a short time before his death.

Gavelkind (gā'vel-kīnd), an old English tenure, by which the land of the father was at his death equally divided among his sons, or in default of sons, among the daughters. The issue of a deceased son inherited the father's part. Collaterally, also, when one brother died without issue all the other brothers inherited from him. Gavelkind, before the Norman conquest, was the general custom of the realm; it was then superseded by the feudal law of primogeniture, and only retained in Wales and Kent. The custom continued in Wales till the time of Henry VIII; in Kent all land is still held in gavelkind unless specially disgaveled by act of Parliament.

Gavial (gā'vi-al; *Gavialis Gangeticus*), the Indian crocodile, characterized by the narrow, almost cylindrical jaws which form an exceedingly elongated muzzle. The teeth (about 120 in number) are of equal length, and the feet are completely webbed. The males can be distinguished from the females by the shape of the muzzle, which is much smaller at the extremity. The only extant species occurs in South and Eastern Asia, especially in the Ganges. It feeds on fishes and small prey.



Head of Gavial or Gangetic Crocodile (*Gavialis Gangeticus*).

Gavotte (ga-vot'), an air for a dance with two strains, each of four or eight bars, in $\frac{4}{4}$ or $\frac{2}{4}$ time, the starting notes occupying half a bar. Like the minuet, it has been introduced for free treatment into suites, sonatas, etc. The name is said to be derived from the Gavots, the inhabitants of the Gap, in France.

Gay (gā), JOHN, an English poet, born near Barnstaple in 1688, and apprenticed to a silk mercer in London. In 1711 he published his *Rural Sports*, which he dedicated to Pope, with whom he formed a close friendship. In 1712 he became secretary to Anne, Duchess of Monmouth, and his mock-heroic poem, *Trivia, or the Art of Walking the Streets of London*, appeared in the same year. In 1714 his caricature of Ambrose Philips' pastoral poetry was published, under the title of the *Shepherd's Week*, and dedicated to Lord Bolingbroke, by whose interest he was appointed secretary to the Earl of Clarendon, in his embassy to the court of Hanover. In 1715 appeared his burlesque drama of *What d'ye Call It?* but his next piece, the farce, *Three Hours After Marriage*, altogether failed. In 1720 he published his poems by subscription, in 1723 his tragedy, *The Captives*, and in 1726 his well-known *Fables*. His *Beggar's Opera*, the notion of which seems to have been afforded by Swift, was first acted in 1727, at Lincoln's Inn Fields, where it ran for sixty-three nights, but the lord chamberlain refused to license for performance a second part entitled *Polly*. The latter part of his life was spent in the house of the Duke of Queensberry, where he wrote his sonata *Acis and Galatea* and the opera *Achilles*. He died in 1732.

Gay, MARIE-FRANÇOISE-SOPHIE, a French authoress, born at Paris in 1776; maiden name, Nichault de Lavalette. She was first married to a financier, M. Liottier, from whom after six years she was divorced to marry M. Gay, a receiver general under the empire. Her salon was a famous resort for the men of letters and artists of the time. She died at Paris in 1852. Her chief works are *Laure d'Estell* (1802), *Anatole* (1815), *Le Moqueur Amoureux* (1830), *Scènes de Jeunes Ages* (1833), *La*

Duchesse de Châteauroux (1834), *Les Salons Célèbres* (1837), and *Le Mari Confident* (1849). For her daughter, DELPHINE GAY, see *Girardin (Madame de)*.

Gaya (gī'â), the chief town of a district of the same name in Bengal, on the right bank of the Phalgu, a tributary of the Ganges, 260 miles N. W. of Calcutta. It consists of an old and a new town. The former occupies a rocky height, is inhabited chiefly by Brahmans, and being regarded as a place of great sanctity, is annually visited by vast crowds of pilgrims. The latter, called Sahibganj, is the trading quarter, and the seat of administration where the European residents dwell. The place abounds with objects of Hindu worship, and almost every height in the vicinity is the subject of a legend. Pop. 71,288. The district has an area of 4712 square miles.

Gayal, GYAL (gī'al), a species of ox (*Bos frontālis*) found wild in the mountains of Northern Burmah and Assam, and long domesticated in these countries and in the eastern parts of Bengal. The head is very broad and flat in the upper part, and contracts suddenly towards the nose; the horns are short and slightly curved. The animal has no proper hump, but on the shoulders and forepart of the back there is a sharp ridge. The color is chiefly a dark brown. Its milk is exceedingly rich, though not abundant.

Gayarre (gī-â-rā'), CHARLES ARTHUR, historian, born in Louisiana in 1805; died in 1895. He was secretary of state of Louisiana 1846-53, and presiding judge of the city of New Orleans. He wrote *History of Louisiana* and *Louisiana: Its History as a French Colony.*

Gay-Lussac (gā-lûs-āk), LOUIS JOSEPH, a French chemist and physicist, born at St. Léonard (Haute-Vienne) in 1778; died at Paris in 1850. He was educated in the Ecole Polytechnique from 1797 to 1800, and afterwards in the Ecole des Ponts et Chaussées, but preferring chemistry, he entered Berthollet's Ecole Laboratory. In 1802 he returned to the Polytechnique as demonstrator of chemistry, and in 1804 performed his two balloon ascents for scientific purposes, the first with Biot, the second by himself, an account of which appeared in the *Journal de Physique.* In 1806 he was elected to the Academy of Sciences. In 1808 he was appointed professor of physics at the Sorbonne, a post he held for twenty-four years, in 1809 professor of chemistry in the Ecole Polytechnique, and then succeeded Fourcroy as professor of general chemistry in the Jardin des Plantes. In 1831 he entered the chamber of deputies, and in 1839 he was made a peer of France, but he never took an active part in politics. He was especially celebrated for his researches into the chemical and physical properties of gases and vapors. For many years he edited, in conjunction with Arago, the *Annales de Chimie et de Physique;* and many of his numerous memoirs were published in this or in the *Comptes Rendus.* He also published, along with Thénard, *Recherches Physico-chimiques,* in which some of their most important discoveries are described. Other works are his *Cours de Physique* and *Leçons de Chimie.*

Gaynor (gā'nor), WILLIAM J., jurist, born at Whitestown, New York, in 1851. He went to Brooklyn in 1873 and worked on Brooklyn and New York newspapers while studying law. Was admitted to the bar in 1875, and took part in many important cases, becoming known nationally for his work in breaking up rings in the Democratic party and in securing the conviction of John Y. Kane for election frauds. He was elected judge of the Supreme Court of New York in 1893 and again in 1907, for twelve years, declined a nomination for mayor of Brooklyn in 1897, also for governor of New York and for judge of the Court of Appeals, and in 1909 was elected Democratic mayor of New York. As such he gave eminent satisfaction by his earnest efforts to improve conditions in that city. In the nominating convention for governor in 1910 he declined to let his name be used. He was shot by a disappointed office-seeker in the summer of 1910, receiving a serious but not a fatal wound. He died September 11, 1913.

Gaza (gā'za), an ancient town of Syria, originally a city of the Philistines, near the Mediterranean, 50 miles S. S. W. of Jerusalem. The modern town, Ghuzzeh, is a principal entrepôt for the caravans passing between Egypt and Syria. The population has increased rapidly of recent years and is now estimated at 16,000.

Gaza (gā'zà), THEODORE, a Renaissance scholar, born at Thessalonica about 1405; died in Calabria in 1478. He came to Italy about 1430; became teacher of Greek at Ferrara; was patronized by Pope Nicholas V, Cardinal Bessarion, and King Alfonso of Naples. Gaza labored for the diffusion of Greek literature, not only by teaching, but also by his writings, and especially by Latin translations of the Greek clas-

sics. His chief work is a translation of the writings of Aristotle on natural history.

Gazelle (ga-zel'; *Gazella dorcas*), the type of a sub-family of antelopes (Gazelinæ), which includes some 23 species of small, mostly desert-loving forms. Its color is a light fawn upon the back, deepening into dark-brown in a wide band which edges the flanks and forms a line of demarcation between the color of the upper portions of the body and the pure white of the abdomen. The eye of the gazelle is large, soft, and lustrous. Both sexes are provided with horns, round, black, and lyrated, about 13 inches long. It seems to be confined to the north side of the Atlas Mountains, Egypt, Abyssinia, Syria, Arabia, and South Persia.

Gazelles (*Gazella dorcas*)

Gazette (ga-zet'; from *gazzetta*, a small Venetian coin, which was the price of the first newspaper), a newspaper, especially an official newspaper. The first gazette in England was published at Oxford in 1655. On the removal of the court to London the title of *London Gazette* was adopted. It is now the official newspaper, and published on Tuesdays and Fridays. It is the organ by means of which all state intelligence, proclamations, appointments, etc., are promulgated, and in which declarations of insolvency are published. A similar official newspaper is published also in Edinburgh and Dublin.

Gazetteer (gaz-e-tēr'), a geographical dictionary; a book containing descriptions of natural and political divisions, countries, cities, towns, rivers, mountains, etc., alphabetically arranged. Among the more important general works of this kind are McCulloch's *Geographical Dictionary*, Johnstone's *Dictionary of Geography*, Blackie's *Imperial Gazetteer*, Lippincott's *Pronouncing Gazetteer* (based upon Blackie's), Saint Martin's *Nouveau Dictionnaire de Géographie Universelle*, and Ritter's *Geographisch-Statistisches Lexikon*. There are also various gazetteers confined to particular countries.

Gazogene (gaz'u-jēn), an apparatus used for manufacturing aerated water on a small scale for domestic use, by the combination of an alkali and an acid, as carbonate of soda and tartaric acid, which yield carbonic acid when mixed with water. It generally consists of two globes, one above the other, connected by a tube, the lower for containing water, and the upper the ingredients for producing the gas. The vessel is made air-tight by means of a screw-top, and when water is gently introduced into the upper globe from the lower, by inclining the vessel so as to fill about a half of the former, chemical action takes place, and the carbonic acid evolved gradually saturates the water in the lower globe. When this has taken place the aerated water can be drawn off by opening a stopcock at the top attached to a second tube which reaches almost to the bottom of the lower globe.

Gean (gēn), a kind of wild cherry-tree (*Prunus Avium*), common in Britain. The fruit is smaller than that of the common cherry, of a red color when unripe, and a deep purple or black when it arrives at maturity. The flavor is superior to that of most cherries. The wood is used for furniture and other purposes.

Gearing (gē·ing), in machinery, the parts collectively by which motion communicated to one portion of a machine is transmitted to another, generally a train of toothed wheels. There are two chief sorts of wheel gearing, viz. *spur-gearing* and *beveled gearing*. In the former the teeth are arranged round either the concave or convex surface of a cylindrical wheel in the direction of radii from the center of the wheel, and are of equal depth throughout. In *beveled gearing* the teeth are placed upon a beveled surface round a wheel which if the slope of the bevel were continued would form a cone.

Geary (gē're), JOHN WHITE, born in Westmoreland County, Pennsylvania, in 1819; died in 1873. He became an engineer officer in the Mexican war, and then the first United States postmaster of San Francisco. Returning to the East in 1856, he became governor of Kansas Territory and restored order there, but resigned in 1857. During the Civil war he served with distinction and became a brigadier general, and at the close major general. In 1866 he was elected governor of Pennsylvania and re-elected in 1869.

Gebang Palm (gē-bang'), the *Corypha gebanga*, a fan-leaved palm of S. E. Asia.

Geber (gē'bėr), an Arabian chemist or alchemist, often designated the father of chemistry, who flourished during the eighth century. He was

acquainted with nearly all the chemical processes in use down to the eighteenth century. His writings describe various kinds of furnaces and other apparatus, and cupellation, distillation, and other chemical processes; the purification, composition, and properties of the metals then known—gold, silver, copper, lead, tin, and iron, and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works, as well on metaphysics, language, astronomy, etc., as on chemistry.

Gecko (gek'ō), a name common to the members of a family of nocturnal lizards (*Geckotidæ*), characterized by the general flatness of their form, especially of the head, which is somewhat of a triangular shape; the body is covered on the upper part with numerous round prominences or warts; the feet are rather short, and the toes of nearly equal length and furnished with flattened sucking pads by means of which the animals can run up a perpendicular wall, or even across a ceiling. The greatest number feed on insects and their larvæ and pupæ. Several of the species infest houses, where, although they are perfectly innocuous, their appearance makes them unwelcome tenants. One species is common in N. Africa and S. Europe.

Ged (ged), WILLIAM, the inventor of stereotyping, born in Edinburgh about the beginning of the eighteenth century; died in poor circumstances in 1749. He first practiced his great improvement in the art of printing in 1725; and some years later he entered into a partnership in London, the result of which was the production of two prayer-books only. He returned to Scotland in 1733, and published a stereotype edition of Sallust.

Geddes (ged'es), ALEXANDER, a Roman Catholic divine, poet, and miscellaneous writer, was born in Banff, Scotland, in 1737; died in London 1802. His works include a translation of the Bible, pamphlets, and poems.

Geddes, SIR ERIC CAMPBELL, British railroad expert and First Lord of the Admiralty, was born in 1875 in India of Scotch parents. When he was seventeen he came to America. In Alabama he worked as a lumberjack and sailed for Australia when he was twenty-one. He spent a year sheep herding and went to India, where, within five years, he became traffic manager of a railroad. From there he was promoted to the management of the North Eastern Railway of England. In May, 1915, he was made Deputy Director General of Munitions, and Premier Lloyd George appointed him Director of Military Railways and Director-General of Transportation in France. On the retirement of Sir Edward Carson he became First Lord of the Admiralty.

Geddes, JENNY, the name tradition gives to a street fruit-seller who, during the tumult in St. Giles' Church, Edinburgh, in July, 1637, when the dean attempted to introduce the Episcopalian service-book, threw her stool at his head exclaiming, 'Villain! dost thou say mass at my lug?' This tumult led to events which annulled Episcopacy and restored Presbyterianism. The honor of the exploit has been claimed for a Barbara Hamilton, wife of John Mein, merchant in Edinburgh, but Jenny Geddes, the street fruit-seller's claim, has always been the popular one, and recently a memorial brass was placed in St. Giles to her memory.

Geefs (gāfs), GUILLAUME, a Belgian sculptor, born at Antwerp 1806, died 1883. Among his most important works are the monument to the Victims of the Revolution of 1830 at Brussels; a statue of Rubens in front of Antwerp Cathedral; statues of King Leopold, etc. His brothers JOSEPH (died 1860) and ALOYS (died 1841) were also sculptors of reputation.

Geel (gāl). See *Gheel*.

Geelong (gē-long'), an Australian seaport town, colony of Victoria, near the head of the west arm of Port Philip Bay, 45 miles southwest of Melbourne. The town is well laid out, and there is an extensive botanical garden and several public parks. There are three jetties in the bay, alongside of which ships of the largest tonnage can load and discharge. There are wool mills, tanneries, ropeworks, etc., and a considerable trade is done in wool. Pop., inclusive of suburbs, 23,311.

Geestemünde (gā's'tē-mün-dē), a seaport town of North Prussia, in Hanover, at the mouth of the Weser, separated from Bremerhaven by the Geeste. Extensive docks were constructed here in 1857-63. The port is strongy fortified, and the trade is increasing rapidly. The industries include shipbuilding, iron-founding, engineering, etc. Pop. 23,625. Geestendorf, formerly a separate town, has been united with it since 1889.

Geez (gēz), the name of an Ethiopian language. See *Ethiopia*.

Gefle (yef'le), a seaport of Sweden, near the mouth of a river of same name in the Gulf of Bothnia, 50 miles N. of Upsala. It stands on both

sides of the river and two islands formed by it, and has an excellent harbor. It has manufactures of linen, leather, tobacco, sail-cloth, etc.; shipbuilding yards; and an extensive trade in deals, tar, pitch, iron, etc. Pop. 29,522.

Gegenbaur (gā'gen-bour), anatomist, born at Würzburg, Germany, in 1826. He studied biology, became professor of anatomy at Jena in 1858 and at Heidelberg in 1873. He wrote several able works, chief among which is his *Outline of Comparative Anatomy*.

Gehenna (gē-hen'a), a term used in the New Testament as equivalent to a place of fire or torment, and rendered in the authorized (and the revised) version by *hell* and *hell-fire*. It is a form of the Hebrew *Ge-hinnom*, the valley of Hinnom, in which was Tophet, where the Israelites sometimes sacrificed their children to Moloch (II Kings, xxiii, 10). On this account the place was afterwards regarded as a place of abomination, and became the receptacle for the refuse of the city, perpetual fires being kept up in order to prevent pestilential effluvia.

Geibel (gī'bl), EMANUEL, a German poet, born at Lübeck in 1815; died 1884. He studied at the universities of Bonn and Berlin, and resided a year or two in Greece. He published in 1840 his first collection of poems, which reached its hundredth edition in 1884. In 1843 he published a tragedy, *King Roderick*; in 1846 the epic *König Sigurd's Brautfahrt*. A second collection of his poems appeared in 1848—*Juniuslieder* ('June Songs'). Other collections were issued later. He was honorary professor of æsthetics and poetry in the University of Munich 1851-69, but spent his later days in his native town. He wrote also *Brynhild*, a tragedy; *The Loreley*, an opera in rhyme; and several other plays, but his fame rests on his lyrics, which are immensely popular.

Geikie (gē'ki), SIR ARCHIBALD, geologist, born at Edinburgh in 1835. He was appointed to the geological survey in 1855; became director of the Scottish survey in 1867; was professor of geology and mineralogy in Edinburgh University 1870-81, and in 1881 became director general to the United Kingdom survey, and head of the Museum of Practical Geology, London. He is the author of numerous manuals, etc., on geology.

Geikie, JAMES, geologist, brother of Archibald Geikie, was born at Edinburgh in 1839. He was engaged on the Scottish survey from 1861 until he succeeded his brother in the geological professorship at Edinburgh in 1882. He is the author of *The Great Ice Age*, *Prehistoric Europe*, *Outlines of Geology*, etc. He died March 2, 1915.

Geissler's Tubes (gis'lêr), from the name of Heinrich Geissler, a philosophical instrument-maker of Bonn, who produced tubes made of very hard glass, and containing highly rarefied gases. Each end of the tube has a platinum wire sealed into it to serve as an electrode. When a discharge of electricity from an induction coil is caused to take place in these tubes, very brilliant effects may be produced.

Gela (jē'la), one of the most important ancient Greek cities of Sicily, situated on the south coast of the island between Agrigentum and Camarina; founded in 690 B.C. by a colony of Cretans and Rhodians. The colony was remarkably prosperous, and in 582 B.C. sent out a portion of its inhabitants, who founded Agrigentum. In 280 Phintias, the tyrant of Agrigentum, utterly destroyed Gela. Its site has been the subject of much controversy.

Gelada (gel'a-da), a singular Abyssinian baboon, remarkable for the heavy mane which hangs over the shoulders, and which only grows when the animal is adult. It is called *Gelada Ruppellii*, in honor of Dr. Ruppell, its discoverer.

Gelasius (je-la'si-us), the name of two popes—GELASIUS I and II. The former, who held the see from 492-496, founding on the alleged primacy of Peter, was one of the first who openly maintained that the Roman bishop alone was entitled to regulate matters of faith and discipline, though in practice he had not then attained any such superiority. GELASIUS II, pope for only one year (1118-19), and originally called John of Gaeta, was elected by the party hostile to Henry V, but was obliged to give way to Gregory VIII, supported by the emperor, and shortly after died in the monastery of Clugny.

Gelatine (jel'a-tin), a concrete animal substance, transparent, and soluble slowly in cold water, but rapidly in warm water. It is confined to the solid parts of the body, such as tendons, ligaments, cartilages, and bones, and exists nearly pure in the skin, but it is not contained in any healthy animal fluid. Its leading character is the formation of a tremulous jelly when its solution in boiling water cools. Gelatine does not exist as such in the animal tis-

sues, but is formed by the action of boiling water. The coarser forms of gelatine from hoofs, hides, etc., are called *glue;* that from skin and finer membranes is called *size;* and the purest gelatine, from the air-bladders and other membranes of fish, is called *isinglass.* With tannin a yellowish white precipitate is thrown down from a solution of gelatine, which forms an elastic adhesive mass, not unlike vegetable gluten, and is a compound of tannin and gelatine. It is this action of tannin on gelatine that is the foundation of the art of tanning leather. In relation to the arts the uses of gelatin have been greatly extended. It is the foundation of the dry-plate system of photography; it is used in the printing process employed by Goupil of Paris and others for making highly artistic copies of pictures; and it is extensively utilized by druggists for coating pills and nauseous drugs. In the form of isinglass it is employed by brewers for clarifying beer, and also for wine, by reason of its forming a coagulum when acted upon by the chemicals of those liquids and precipitating the extraneous matter held in solution.

Gelderland, GUELDERLAND (gel'derland), a province of the Netherlands; area, 1963 English sq. miles. It is generally flat, and has much alluvial soil, well fitted both for arable and grass husbandry. The manufactures, principally woolen, cotton, and linen goods, soap, salt, and glass, are carried on extensively in various quarters. The principal towns are Arnheim, Nijmegen, Thiel, and Zutphen. Pop. 566,549.

Geldern (gel'dĕrn), a town of Rhenish Prussia, 27 miles northwest of Düsseldorf. Pop. 6551.

Gelder-rose. See *Guelder-rose.*

Gelee (zhē-lā), CLAUDE. See *Claude Lorraine.*

Gell (jel), SIR WILLIAM, an English antiquarian and classical scholar, born in 1777; died at Naples in 1836. He was educated at Cambridge, and was for some time a fellow of Emanuel College in that university. In 1814 the Princess of Wales (afterwards Queen Caroline) appointed him one of her chamberlains, and he accompanied her on her travels for several years. His principal works are: *The Topography of Troy, The Geography and Antiquities of Ithaca, The Itinerary of Greece, The Itinerary of the Morea, The Topography of Rome,* and the interesting and beautiful work, *Pompeiana, or Observations Upon the Topography, Edifices, and Ornaments of Pompeii.*

Gellert (gel'ĕrt), CHRISTIAN FÜRCHTEGOTT, a German poet, born in 1715; died in 1769. He was appointed extraordinary professor of philosophy at Leipzig in 1751, where his lectures were received with great applause. His hymns, tales, fables, and essays enjoyed much popularity in their day.

Gellius (jel'lius), AULUS, a Roman author of the second century. His *Noctes Atticæ,* a book of selected passages from many ancient authors, is now of great value, as the authors from which he drew his materials are in a great measure lost.

Gelnhausen (geln'hou-zn), an old walled town of Prussia, province Hesse-Nassau, 16 miles E. N. E. of Hanau, on the Kinzig. Its principal buildings are a large Gothic church of the thirteenth century, and, on an island in the Kinzig, a recently-restored palace in which Frederick Barbarossa and several of his successors used to reside. Pop. 4500.

Gelon (jē'lon), an ancient Greek ruler, tyrant of Gela, and afterwards of Syracuse. After the death of Hippocrates, tyrant of Gela, he seized the sovereign power (B.C. 491), and about 485 B.C. gained possession of Syracuse. From this time he bent all his energies to the aggrandizement of his new capital, the power and importance of which he greatly increased by his conquests and good government. His aid was sought by the Greeks against Xerxes, but a formidable invasion of Carthaginians under Hamilcar engaged him in Sicily. The result was the total defeat of the Carthaginians in the great battle of Himera (B.C. 480). It is celebrated in an ode by Pindar. Gelon died in 478 B.C., and was succeeded by his brother Hieron.

Gelsemium (jel-sē'mi-um), a genus of plants belonging to the nat. order Loganiaceæ, the best-known, *G. nitidum* or Carolina jasmine, being an evergreen climbing shrub of the Southern States, with twigs producing a milky juice, opposite lance-shaped shining leaves, and sweet-scented yellow flowers. The root has valuable medicinal properties, being used for controlling certain forms of nervous irritability.

Gemara (ge-mä'ra), in Jewish literature, the second part of the Talmud or commentary on the Mishna. See *Talmud.*

Gembloux (zän-blŏ), an old Belgian town, province of Namur, 24 miles S. E. of Brussels. It has a Benedictine abbey of the ninth cen-

tury, now used as a royal agricultural institution. Pop. 4648.

Gemini (jem'i-nī, the Twins (II), the third sign of the zodiac, so named from its two brightest stars, Castor, of the first magnitude, farthest to the west, and Pollux, of the second, farthest to the east. Its constituent stars form a binary system revolving in about 250 years. The sun is in Gemini from about May 21st till June 21st, or the longest day.

Gemmation (jem-mā'shun), in zoology, a mode of reproduction among certain animals of low type, which consists in the production of a bud or buds, generally from the exterior, but sometimes from the interior, of the body of the animal, which buds are developed into independent beings that may or may not remain attached to the parent organism. The fresh beings thus produced are known as zooids. Gemmation is also observed in plants of simple organization such as the yeast.

Gems (jems), or precious stones, are sometimes found crystallized in regular shapes and with a natural polish, more commonly of irregular shapes and with a rough coat. The term gem often denotes more particularly a stone that is cut, polished, or engraved, and it also includes pearls and various artificial productions. Precious stones in their natural state are usually encrusted with various deposits; and it is to remove this crust and to bring out the real beauty of the gem that the work of cutting and polishing is performed. The stones that are thus treated include the ruby, diamond, emerald, sapphire, garnet, topaz and amethyst. These are classed as transparent stones. The opal is semi-transparent. Among the more or less opaque stones are the turquoise, lapis lazuli, agate, onyx, cat's-eye, moonstone, bloodstone, jade and carnelian. Imitation gems are extensively manufactured. The base of one class of imitations is a peculiar kind of glass of considerable hardness, brilliancy and refractive power called *paste* or *strass*. When the strass is obtained very pure it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the most varied colors. Another class often fraudulently offered for sale as genuine stones are made by cementing thin plates of precious materials over and sometimes under a body of worthless glass. This veneered stone successfully undergoes the surface test, and by the uninitiated is often accepted as a valuable gem.

The art of manufacturing gems synthetically, that is, by the combination of chemical elements present in the real stone, has reached a high degree of success. The diamond, which is an allotropic form of carbon, has hitherto resisted attempts to reproduce it of sufficient size to have a commercial value. By dissolving carbon in molten iron and suddenly cooling the molten mass by a stream of water, whereupon the outer part contracts with great force and compresses the interior so that the carbon separates out, Moissan, the French chemist, succeeded in isolating small crystals, none, however, as large as 1/25 inch in diameter.

Experiments in the manufacture of the ruby have met with such success that the synthetic ruby is produced of a size and of a perfection that would place a prohibitive value on the natural stone. The ruby, chemically considered, is crystallized alumina, or oxide of aluminum, with a small percentage of oxide of chromium. Sapphire is of the same material, differing from the ruby only in color. The ruby owes its fine red color to the presence of oxide of chromium; the sapphire its deep blue to either a lower oxide of chromium or to an oxide of titanium. Crystallized alumina in the different colors receives different trade names, as Oriental emerald for the green; Oriental topaz for the yellow; Oriental amethyst for the purple; while the water-clear, colorless crystal is known as white sapphire. The process of manufacture of rubies is carried on with the oxyhydrogen blowpipe, to whose intense heat the powdered alumina with its coloring oxides is subjected. Rubies have been thus produced weighing 12 to 15 carats when cut. The average weight of the native Burmese ruby is about one-eighth of a carat. The sapphire and the so-called Oriental stones are prepared in the same manner, with the addition of proper coloring matter. The emerald and opal have not emerged from the experimental stage, although Becquerel, a French chemist, is reported to have produced opals from solutions of silicates with high-tension electric currents. To be distinguished from synthetic gems are reconstructed stones, which (as yet only done with the ruby) are pieces of the natural stone fused together. They are very brittle. The pearl is not produced synthetically, but many imitations exist. The Japanese produce them by fastening a piece of mother-of-pearl in the shells of the pearl-oyster and allowing it to remain there for a number of years. The turquoise, a phosphate of aluminum colored with copper, is not synthetically produced, although various experiments with its manufacture have been made.

Gemsbok (jemz'bok), the *Oryx gazella*, a large and powerful member of the antelope family, inhabiting the plains of South Africa. It equals the domestic ass in size, has a short, erect mane, a long, sweeping, black tail, and long, sharp-pointed, heavy horns, nearly straight from base to tip, and obscurely ringed throughout the lower half. By the aid of these natural bayonets it can easily defend itself from the smaller Carnivora, and it has been known to drive off, and even kill, the lion himself, when attacked by him.

Gendarmes (zhân-dârm), the name originally given in France to the whole body of armed men, but after the introduction of standing armies to a body of heavy-armed cavalry, which composed the chief strength of the forces. Gendarmes are now the French armed police. They are all picked men; they are usually taken from the regular forces, and are of tried courage or approved conduct. There are *horse gendarmes* and *foot gendarmes*. They are formed into small parties called *brigades*; and the union of a number of these forms a *departmental company*.

Gender (jen'der), in grammar one of those classes or categories into which words are divided according to the sex, natural or metaphorical, of the beings and things they denote. It may be exhibited by a class of words marked by similarity in termination, the termination having attached to it a distinction in sex, as seen in nouns, adjectives, participles, etc. There are three genders in all: *masculine*, *feminine*, and *neuter*, but these three distinctions only exist in some languages. In Sanskrit, Greek, and Latin all three are present, as also in German and English. English words expressing males are said to be of the *masculine* gender; those expressing females, of the *feminine* gender; and words expressing things having no sex are of the *neuter*, or *neither* gender. Gender is thus coincident with sex in English, and is a very simple matter. But in other languages sex and gender have little or no necessary relation, the majority of the names applied to inanimate objects being either masculine or feminine, and the grounds for such distinction being quite obscure. In the languages derived from the Latin—Italian, French, Spanish, and Portuguese—a neuter gender is not recognized. In the highly inflected languages there are certain terminations distinctive of the different genders, but in English gender only to a slight extent depends on the form of the word—*ess*, for instance, is a feminine termination. In English the gender of a noun only affects the pronoun substituted for it.

Genealogy (je-ne-al'ō-ji), the systematical investigation and exhibition of the origin, descent, and relations of families (or their *pedigree*). Persons descended from a common father constitute a family. Under the idea of *degree* of relationship is denoted the nearness or remoteness of relationship in which one person stands with respect to another. A series of several persons, descended from a common progenitor, is called a *line*. A line is either *direct* or *collateral*. The collateral lines comprehend the several lines which unite in a common progenitor. For illustrating descent and relationship genealogical tables are constructed, the order of which depends on the end in view. The common form of genealogical tables places the common stock at the head, and shows the degree of each descendant by lines. Some tables, however, have been constructed in the form of a tree, in which the progenitor (German, *Stammvater*) is placed beneath, as if for a root.

General (jen'er-al), the commander of an army, or of a division or brigade; the highest military title, with the exception of that of field-marshal. In the United States service there are three ranks, the highest *general*, the second *major-general*, and the lowest *brigadier-general*, the last being immediately above a colonel, as in other services. In Britain three similar ranks exist, their titles being *general*, *lieutenant-general* and *major-general*. *General*, in the Roman Catholic Church, is the title given to the supreme head, under the pope, of a monastic order. In most of the orders he is elected for three years, or some other fixed term, by the Jesuits for life, but the election must be confirmed by the pope.

General Assembly. See *Assembly* (*General*).

Generalization (jen-er-al-i-zā'shun), in logic, is the act of comprehending, under a common name, several objects agreeing in some point which we abstract from each of them, and which that common term serves to indicate.

General Lien (lēn), in law, is the right to retain possession of a chattel until payment be made, not only of any debt due in respect of that particular chattel, but of any balance that may be due on general account in the same line of business. General liens do not exist at common law, but depend entirely upon contract express or

implied from the special usage of dealing between the parties.

General Paralysis, known also as General Paralysis of the Insane, Dementia Paralytica, and Progressive General Paralysis, is a disease due to the progressive destruction of the nerve cells of the brain cortex and to hypertrophy of the supporting connective tissue, and is frequently attended by spinal complications. It occurs most commonly in adult males, and can almost always be traced to syphilitic or alcoholic degeneration. Later research, instituted by the growing frequency of this disease and its serious character, has resulted in the conclusion that it is a parasyphilitic type of disease. The *spirochæta pallida*, the essential germ-organism of syphilis, is present in the central nervous system of a large proportion of the cases of general paralysis, and nearly all of them give a positive Wassermann reaction. The presence of an organism resembling the Klebs-Loeffler bacillus has been detected, and for a time it was held that the disease was due to a bacterial toxin; but this theory has since been abandoned, and it is now believed that if these bacteria play any part in the progress of the malady, it is of secondary importance. The symptoms of general paralysis may be divided into mental, sensory and motor. The mental symptoms are characterized by lack of adjustment, lack of will power, indecision and irritability; also by moral perversions, as indecent exposure, criminal assault, theft and various minor offenses. Among the sensory symptoms, loss of sight and hearing, formications and anesthesias are common. The motor symptoms are marked by the loss of power of expression by speech or in writing, aphasia, irregular gait and a change in the pupillary reflex. The mental defect associated with these departures from the normal may assume various forms, as alternating periods of excitement and depression, with periods in between of a return to the normal state. This is the so-called paralysis of double or circular form. The second group shows a progressively increasing loss of mental power, the memory, business capacity and will power gradually deteriorating, with only slightly marked evidence of depression or excitement. A third group comprises cases of expansive delirium or maniacal excitement. Extravagant delusions as to the wealth and power, and extreme excitement passing into homicidal mania, are distinguishing features of this class. In a fourth group depression associated with loss of memory and with delusions is a marked symptom. All cases gravitate toward dementia. In the early stages of the disease the physical signs may not be marked. But usually the onset of the malady is characterized by stolidity of countenance, tremulous lips, hindered and blurred articulation, associated with a tremor of the hand and arm which interferes with writing, and an ataxic or spastic gait. The patient is also liable to epileptic or apoplectic seizures. The stage of complete paralysis supervenes. The patient is a physical and mental wreck, bed-ridden, utterly helpless, unable to retain fæces or urine. Death results from exhaustion, in coma or convulsions, from heart failure or lung complications. Recovery from general paralysis is at present of rare occurrence, though recoveries have been reported, taking place before the advanced stages were reached.

General Ship, in maritime law, is a ship announced by the owners to take goods from a particular port at a specified time, and which is not under special contract to particular individuals.

General Staff, is that part of army organization which consists of a number of officers selected for their special fitness to aid in carrying out the principles of military procedure as formulated by the general commanding officer. The body of the general staff had its origin in Germany, where a number of officers, not attached to any corps, were appointed to prepare maps, strategical schemes, and statistics regarding the relative strength of armies. It is to be distinguished from the company of general officers surrounding a commander in the field of war. In the United States the General Staff Corps was created by act of Congress, February 14, 1903. It is governed by rules prescribed by the President, and is made up of about fifty officers who are detailed for a period of four years. Their duties consist in studying the efficiency and strength of the army, plans for defense, mobilization and strategic positions (in time of war).

General Theological Seminary, situated in Manhattan Borough, N. Y., and founded in 1817, is the chief seminary of the Protestant Episcopal Church of America. After many years of financial difficulty it was placed on an independent basis by the gifts of Dean Hoffman, who administered its affairs (1878–1902). It has both an ordinary course of three years and a post-graduate course. It confers the degrees of B.D. and D.D., the latter of which is both academic and honorary. No fees are charged for its tuition, and there are many valuable prizes. Its statistics, in 1914, were: faculty, 15; students, 137; library, 58,585 volumes.

Generalization, the act of comprehending under a general name a number of objects which agree in one or more points. The general term stands for the many objects in so far only as they all agree. This process is akin to classification and definition; and the higher form of it is induction.

Generation (jen-er-ā'shun), a single succession of human beings (or animals) who are born, grow up, and reproduce their kind; hence, an age or period of time between one succession and the next, as the third, the fourth, or the tenth generation. The length of a human generation is usually estimated at about thirty years.

Generation. See *Reproduction.*

Generation, ALTERNATE, or METAGENESIS, that kind of multiplication, seen in some invertebrate animals or even in plants, in which parents produce progeny unlike, sometimes extremely unlike, themselves, while this unlike progeny give rise to others resembling the original forms. Sometimes there are more than one unlike form between these like forms. The Hydrozoa abundantly illustrate this phenomenon, also the Echinoderms, Polyzoa, Tunicata, the wheel animalcules, Nematoid worms, flatworms, tapeworms, several of the true Annelids among Crustaceans, Daphnia, the Phyllopods among Insects, the plant-lice. The steps may be seen in certain of the Hydroid Polyps, thus: (1) There is an ovum or egg, free-swimming and impregnated. (2) This ovum attaches itself to a fixed submarine object, and develops into an organized animal. (3) This organism produces buds or zooids, often of two kinds—one set nutritive, the other generative—unlike each other and unlike their parent, the whole forming a hydroid colony. (4) The generative set mature eggs, which on being liberated become the free-swimming ova (No. 1), and the cycle is renewed. A somewhat similar phenomenon is that of *Parthenogenesis* (which see).

Generation, SPONTANEOUS, or ABIOGENESIS, the doctrine that living matter may originate spontaneously, 'that under certain circumstances dead matter may build itself up into living matter without the intervention of already existing protoplasm.' In the 17th century this was the dominant view, sanctioned alike by antiquity and authority, and was first assailed by Redi, an Italian philosopher. Buffon held the doctrine in a very modified degree. He held that life is the indefeasible property of certain indestructible molecules of matter which exist in all living things, and have inherent activities by which they are distinguished from non-living matter. Of course it is only animals or plants of very low type and minute size that have been supposed to be produced spontaneously, and the readiness with which such appear lends plausibility to the theory. Experiments of recent date, moreover, seem to point to the spontaneous origin of life. Dr. H. Charlton Bastian and others claim that they succeeded in obtaining living organisms from certain chemical solutions. Dr. Edward A. Schafer, of the British Association for the Advancement of Science, points out that biology tends to obliterate the line between living and non-living matter.

Generator. See *Dynamo.*

Generic Name (je-ner'ik), in natural history, the denomination which comprehends all the species of a genus; thus *Canis* is the *generic* name of animals of the dog kind; *Felis*, of the cat kind; *Cervus*, of the deer kind. See *Genus.*

Genesee (jen-e-sē'), a river of the United States, which rises in Pennsylvania, flows north through New York, and falls into Lake Ontario 6 miles below Rochester, after a course of 145 miles. It is notable for its varied and romantic scenery, and its extraordinary falls. These falls are five in number: three of them occur about 90 miles from the mouth of the river, and are respectively 60, 90 and 110 feet high. The other two are near Rochester, and are both about 100 feet high.

Genesis (jen'e-sis; Greek, creation, birth, origin), the first book of the Bible and of the Pentateuch, named in the Hebrew canon *B'reshith* ('In the *Beginning*'), from the term with which it commences. From the Greek translators it received the name it is now commonly known by. Genesis consists of two great but closely connected divisions:—(1) The history of the creation, the fall of man, the flood, the dispersion of the human race, chap. i-xi. (2) The history of the fathers of the Jewish race, chap. xii-l. A certain apparent difference of style and language, the occurrence of what seem gaps on the one hand, and repetitions and contradictions on the other, and the different use of the term for the divine name (*Jehovah*, Everlasting; and *Elohim*, Almighty), led very early to the question of the integrity of the book, and various critics declare that larger or smaller interpolations have been made in the original text.

Genet (jen'et), a digitigrade carnivorous mammal of the family Viverridæ. The genus *Genetta* contains five species, the best known of which is the *G. vulgaris*, the common genet, whose range extends all around the Mediterranean, including Western Asia, Northern Africa, and Southern Europe. It is about the size of a small cat, but of a longer form, with a sharp-pointed snout, upright ears, and a long tail. It has a beautiful soft fur, and, like the civet, produces an agreeable perfume. The habits of the genet are like those of the weasel tribe; it is easily tamed, and is sometimes employed in Constantinople and elsewhere to catch rats and mice.

Geneva (je-nē'va; German, *Genf*; French, *Genève*), a town of Switzerland, capital of the canton of the same name, situated at the western extremity of the Lake of Geneva, where the Rhône issues, here crossed by several bridges, and dividing the town into two portions, the larger and more important of which is on the left or south bank. The environs are covered with handsome villas, and the town itself, when approached either by land or water, has a very attractive appearance. It was formerly surrounded by walls and regular fortifications, but since 1850 these have been removed. The town is divided into two parts, an upper and a lower. The upper town, occupied chiefly by the wealthier citizens, consists of well built houses and handsome hotels; the lower town, the seat of trade and residence of the poorer classes, consists largely of houses remarkable for their height, and lining narrow, irregular, dark, and ill-cleaned streets; but great improvements have recently been carried out. The more important public buildings are the cathedral or Church of St. Pierre, a Gothic structure of the 10th, 11th, and 12th centuries, occupying the highest site in the town, and by its three towers forming the most conspicuous object within it, somewhat defaced externally by a very incongruous Greek peristyle; the town-house in the Florentine style; the Musée Rath containing a collection of pictures and other works of art; the university building, nearly opposite the botanic garden, rebuilt in 1867-71, and containing the public library, founded by Bonivard, the prisoner of Chillon, in 1551, and now numbering 90,000 vols.; and the museum of natural history. The only important manufactures of Geneva are those of watches, musical boxes, and jewelry, for all of which the town is justly famed. Geneva has ample railway communication, and is one of the principal entrances for tourists and travelers into Switzerland. In literature and science Geneva has long occupied a distinguished place, and it has been the birthplace or the residence of many eminent men, including Calvin, Beza, Knox, Le Sage, Necker, De Candolle, Rousseau, Sismondi, etc. Geneva early adopted the principles of the Reformation, and chiefly through the teaching of Calvin, the town acquired an important influence over the spiritual life of Europe, and became the center of education for the Protestant youth of Britain, France, and Germany. Pop. 105,710.—The canton is bounded by the canton of Vaud and the Lake of Geneva, and by France. Area, 109 sq. miles. It belongs to the basin of the Rhône, and the only streams of importance are that river and the Arve, which joins it a little below the town of Geneva. The soil has been so much improved by skillful and preserving culture that abundant crops of all kinds suitable to the climate are raised, and the whole territory wears the appearance of a garden. Manufactures consist chiefly of clocks and watches, musical boxes, mathematical instruments, gold, silver, and other metal wares, woolen cloths, and silk goods of various descriptions, hats, leather, and articles in leather; and there are numerous cotton mills, calico printing works, and dye works. The territory of Geneva having, by the arrangements of the Congress of Vienna, obtained an accession of fifteen communes, detached from France and Savoy, was admitted a member of the Swiss Confederation in 1814, and ranks as the twenty-second canton. Its constitution of 1848 is the most democratic in the federation. All religious denominations are declared to have perfect freedom, but two of them are paid by the state—the Roman Catholics, amounting to rather more than a third of the population, and the Protestant National Church. The language spoken is French. Pop. 132,609.

Geneva. See *Gin*.

Geneva, a city of Ontario County, New York, on Seneca Lake, midway between Syracuse and Rochester, on the Lehigh Valley and New York Central railroads. It has various manufacturing industries and extensive nurseries, and is the site of a state experiment station, and of Hobart College. Pop. 12,446.

Geneva, LAKE OF, or LAKE LEMAN (Latin, *Lacus Lemanus*), the largest of the Swiss lakes, extending in the form of a crescent, with its horns pointing southward, between France on the south, and the cantons of Geneva,

Vaud, and Valais: length, measured on its north shore, 55 miles, and on its south shore, 40 miles; central breadth, about 6 miles; area, 331 sq. miles; greatest depth, 900 feet. It is 1150 feet above the sea. On the north the shore is low, and the ground behind ascends gradually in beautiful slopes. On the south, and particularly at the east end, the shore is rocky and abrupt, and lofty precipices often rise sheer from the water's edge. It contains various species of fish, and its water is remarkably pure and of a beautiful blue color. The Rhône, which enters its eastern extremity a muddy turbid stream, issues from its western extremity perfectly pellucid, and likewise of the finest blue.

Geneva Arbitration. See *Alabama (The)*.

Geneva Bible, a copy of the Bible in English, printed at Geneva; first in 1560. This copy was in common use in England till the version made by the order of James I was introduced, and it was laid aside by the Calvinists with reluctance. It was the first which divided the text into verses and the first to omit the apocrypha. From its stating (Gen., iii, 7) that our first parents made themselves 'breeches,' it is sometimes known as the Breeches' Bible.

Geneva Convention, an agreement concluded at an international conference held in Geneva in 1864, for the succor of the sick and wounded in time of actual warfare. The neutrality of hospitals, ambulances, and the persons attending on them was provided for; and the use of the red cross on a white ground as a sign of neutrality has received the adhesion of all civilized powers. Those wearing it are known as the Red Cross Society (*q. v.*).

Geneviève (jen'e-vēv, *Fr.* zhĕn-vi-āv), the name of two female saints.—1. St. Geneviève, the patron saint of Paris; born at Nanterre, about 5 miles from Paris, in the year 423; died at Paris about the beginning of the 6th century. She devoted herself while yet a child to the conventual life. Her prayers and fastings are credited with having saved Paris from the threatened destruction by Attila in 451. Many legends are told respecting her, and several churches have been dedicated to her. Her festival is held on the 3d January.—2. St. Geneviève, by birth Duchess of Brabant, wife of Siegfried, count palatine in the reign of Charles Martel (about 750). According to the legend, which is the subject of several tales and dramas, she was accused of adultery during her husband's absence and condemned to death; but was allowed to escape, and she lived six years in a cavern upon nothing but herbs. She was finally found, and carried home by her husband, who in the meantime had become convinced of her innocence.

Genghis Khan, or JENGHIS KHAN (jen'gis), a Mongol conqueror, born about 1160; died 1227. His father was chief over thirty or forty clans, but paid tribute to the Tartar khan. He succeeded his father when only fourteen years of age, and made himself master of the neighboring tribes. A great number of tribes now combined their forces against him, but he found a powerful protector in the great Khan of the Karaite Mongols, Oung, or Ung, who gave him his daughter in marriage. After much internecine warfare with various Tartar tribes and many victories Genghis was proclaimed Khan of the United Mongol and Tartar tribes. He now professed to have a divine call to conquer the world, and the idea so animated the spirit of his soldiers that they were easily led on to new wars. The country of the Uigurs, in the center of Tartary, had long excited his ambition. This nation was easily subdued, and Genghis Khan was now master of the greatest part of Tartary. Leading his tribes to conquest in 1209, he passed the great wall of China, the conquest of China occupying him more than six years. The capital, then called *Yenking*, now *Peking*, was taken by storm in 1215 and plundered. The murder of the ambassadors whom Genghis Khan had sent to the King of Kharism (now Khiva) led to his invasion of Turkestan in 1218 with an army of 700,000 men and the two cities of Bokhara and Samarcand were stormed, pillaged, and burned. Seven years in succession was the conqueror busy in the work of destruction, pillage, and subjugation, and extended his ravages to the banks of the Dnieper in Europe. In 1225, though more than sixty years old, he marched in person at the head of his whole army against the king of Tangut (Southwestern China), who had given shelter to two of his enemies, and had refused to give them up. A great battle was fought, in which the King of Tangut was totally defeated with the loss of 300,000 men. The victor remained some time in his newly subdued provinces, from which he also sent two of his sons to complete the conquest of Northern China. At his death his immense dominions were divided among his four sons.

Genii (jē'ni-ī). See *Genius*.

Genipap (jin'i-pap; *Genipapo*, the Guiana name), the fruit of a South American and West Indian

tree, the *Genipa Americana*, nat. order Rubiaceæ. It is about the size of an orange, and of a pleasant vinous flavor.

Genista (jin-is'ta), a genus of leguminous plants, comprising about 100 species, one of which is the *Planta genista*, the *Plante genêt*, from which the Plantagenets took their name. The *Genista tinctoria*, or dyer's broom, so called, as it was formerly much employed by dyers, who obtained a good fixed yellow or orange color from it, is frequent in England and the lowlands of Scotland.

Genitive Case (jen'i-tiv), in grammar, a case in the declension of nouns, adjectives, pronouns, participles, etc., expressing source, origin, possession, and the like. In English grammar the corresponding case is the possessive case.

Genius (jē'nyus), a tutelary deity; the ruling and protecting power of men, places, or things; a good or evil spirit supposed to be attached to a person and influence his actions. The Genii of the Romans were the same as the *Daimônes* (Demons) of the Greeks. According to the belief of the Romans, which was common to almost all nations, every person had his own Genius; that is, a spiritual being, which introduced him into life, accompanied him during the course of it, and again conducted him out of the world at the close of his career. The Genii of women were called *Junones*. The Genii were wholly distinct from the *Manes*, *Lares*, and *Penates*, though they were allied in one important feature—the protection of mortals.

The term *genii* (with the singular *genie*) is also used as equivalent to the *jinn* (singular *jinnee*) of Arabic tales. These are supposed to be a class of intermediate beings between angels and men. See *Jinn*.

Genlis (zäṇ-lēs), Stéphanie Félicité Ducrest de St. Aubin, Countess de, a French authoress, born near Autun 1746; died at Paris 1830. At four years of age she was admitted as a canoness into the noble chapter at Aix, and at seventeen married the Count de Genlis. By this marriage she became niece to Madame de Montesson (who had been privately married to the Duc d'Orleans), and obtained through her the place of lady-in-waiting to the Duchesse de Chartres. In 1782 the Duc de Chartres (Philippe Egalité) appointed her governess of his children. She obtained great influence over her employer, and was the object of no little scandal in her relations with him, which was strengthened by the mysterious appearance of an adopted daughter, afterwards known by the name of Pamela, who married Lord Edward Fitzgerald. At this time she published several works on education, etc. On the breaking out of the Revolution she retired for a while to Switzerland, and then to Altona. In 1800 she returned to France, gained the favor of Napoleon, who gave her a pension. From that time she resided constantly in Paris. Her works, which embrace a wide variety of subjects, amount altogether to about ninety volumes, and include some of the standard novels in the French language. Her voluminous *Mémoires*, written when she was upwards of eighty years of age, abound in scandal, and are full of malignant attacks upon her contemporaries.

Gennesaret (jen-es'a-ret), Sea of. See *Galilee* (*Sea of*).

Genoa (jen'o-a; Ital. *Genòva*, '*La superba*'), a seaport of N. Italy, the chief commercial city of the kingdom, on the coast of the Mediterranean, at the head of the gulf of the same name, 75 miles S. E. of Turin. It is beautifully situated at the foot and on the slope of the Ligurian Alps, the lower hills of which form a background to the city. It is enclosed by extensive fortifications, and the heights around are crowned with detached forts. It has a most imposing effect when approached either by land or sea. In the older parts of the town the streets are extremely narrow, with lofty buildings on either side. In the newer quarters many of them are spacious, and are lined with palaces and other noble edifices. Some of the palaces are filled with works of art by the greatest masters. The principal are—the Ducal palace (now containing the law courts and various public offices), the Palazzo del Municipio or town-hall, the Palazzo Brignole or Rosso (with the largest picture gallery in Genoa), the Palazzo Pallavicini, the Palazzo Reale, built in the sixteenth century for the Durazzo family, was purchased in 1815 by the royal family, and the palaces of Doria, Serra, Cambasio, Balbi, and Durazzo. The most remarkable of the churches is the Duomo, or Cathedral of St. Lorenzo, founded in the eleventh century, but not completed till the beginning of the twelfth; S. Maria in Carignano, built in imitation of the original plan of St. Peter's at Rome; S. Stefano, a Gothic church, the oldest parts of which date from the end of the twelfth century; S. Ambrogio, containing two paintings by Rubens and the Assumption of Guido Reni. The principal charitable institution is the Albergo de' Poveri, in which 1600 individuals, orphans and old people,

find shelter. Others are the Ospedale del Pammatone founded in 1430; and a hospital recently built by the Galliera family. Among the theaters of the city may be mentioned the Teatro Carlo Felice, an elegant structure, with a splendidly fitted up interior. Besides the university, founded in 1775, the chief educational institutions are the theological seminary, the school of fine arts, the royal marine school, and the navigation school. The building of the Bank of St. George, one of the most ancient banks of circulation and deposit in Europe, is now used as a custom-house. In one of the open spaces there is a fine marble statue of Columbus, with accompanying allegorical figures. The Campo Santo, or

Strada Balbi, Genoa.

cemetery, about 2½ miles from the city, is one of the most beautiful burial grounds in Europe. It contains fine mortuary buildings and much statuary in white marble. The manufactures of Genoa include cotton and silk goods, gold, silver, paper and leather goods, sugar, and preserved fruits. The old harbor, which is of a semicircular form and about ¾ mile in diameter, is formed by two moles projecting into the sea from opposite sides; there are now also two outer or additional harbors formed by moles recently constructed. The principal articles of export are cereals, oils, fruit, cheese, rags, the products of its manufactures, etc. Many emigrants embark here. Imports—cotton, wool, wheat, sugar, coffee, coal, hides, iron, etc.

Under the Romans Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constituted itself a republic, presided over by doges. From 1119 it was almost constantly at war with Pisa down to 1284, when Genoa inflicted a crushing defeat on Pisa. The Genoese obtained the supremacy over Corsica, and nominally over Sardinia, possessed settlements in the Levant, on the shores of the Black Sea, on the Spanish and Barbary coasts, and had a very flourishing commerce. The rivalry between Genoa and Venice was a fruitful source of wars during the 12th-14th centuries. Meanwhile the city was internally convulsed by civil discord and party spirit. The hostility of the democrats and aristocrats, and the different parties among the latter, occasioned continual disorder. From the contests of noble rivals, in which the names of Doria, Spinola, Grimaldi, and Fieschi are prominent. Genoa was drawn into the Guelph and Ghibelline contest. In the absence of internal tranquillity the city sometimes submitted to a foreign yoke in order to get rid of anarchy. In the midst of this confusion St. George's Bank was founded. It owed its origin to the loans furnished by the wealthy citizens to the state, and was conscientiously supported by the alternately dominant parties. In 1528 the disturbed state regained tranquillity and order, which lasted till the end of the eighteenth century. The form of government established was a strict aristocracy. The nobility were divided into two classes—the old and new. To the old belonged, besides the families of Grimaldi, Fieschi, Doria, Spinola, twenty-four others, who stood nearest them in age, wealth, and consequence. The new nobility comprised 437 families. By little and little Genoa lost all her foreign possessions. Corsica, the last of all, revolted in 1730, and was ceded in 1768 to France. After the battle of Marengo (1800) Genoa was taken possession of by the French. In 1805 it was formally annexed to the Empire of France, in 1815 to the Kingdom of Sardinia, with which it has become a portion of the Kingdom of Italy. Pop. (1911) 272,221.

Genoa, GULF OF, a large indentation of the Mediterranean, in North Italy, at the head of which lies the city and port of Genoa. No precise points can be named as marking its entrance; but it may, perhaps, be generally said to comprise the entire space north of lat. 43° 40′ N.

Genre-painting (zhän-r), that department of painting in which are depicted scenes of everyday life, in opposition, for instance, to historical painting, in which historic personages are exhibited, or to landscape.

Gens (jens), in Roman history, a clan or stock embracing several families united together by a common name and certain religious rites; as, the Fabian *gens*, all having *Fabius* as part of their personal name; the Julian *gens*, all named Julius; the Cornelian *gens*, etc.

Gens D'Armes. See *Gendarmes.*

Genseric (jen'sėr-ik), a king of the Vandals, who, having obtained joint possession of the throne of Spain with his brother Gonderic, crossed the Straits of Gibraltar with 50,000 men, A.D. 429, on the invitation of Bonifacius, the Roman governor of Africa, to assist him against the Moors. He, however, soon declared his independence, and, having completely defeated Bonifacius, founded a kingdom, which, in 439, had its seat at Carthage. He collected a powerful fleet, ravaged the coasts of Sicily and Italy, and in 455 took and sacked Rome. Two unsuccessful attempts were made by the Eastern and Western emperors to overthrow his power, but Genseric secured all his conquests, and, notwithstanding all his cruelties, was permitted to die in peace A.D. 477.

Gentian (jen'shan), the name given to the members of the genus *Gentiāna* (order Gentianaceæ), a large genus of bitter herbaceous plants, having opposite, often strongly ribbed, leaves, and blue, yellow, or red, often showy flowers. The calyx consists of four or five valvate segments, and the corolla is four or five parted; the fruit is a two-valved, one-celled, many-sided capsule. They are for the most part natives of hilly or mountainous districts in the northern hemisphere. The most important species is *Gentiāna lutĕa*, a native of Switzerland and the mountainous parts of Germany. The root has a yellowish brown color and a very bitter taste, and is imported into the United States in considerable quantities, where it is used medicinally, and also as an ingredient of cattle foods. In Switzerland and Bavaria a liqueur called Ensiangeist or 'gentian-spirit' is made from it. Many of the blue-flowered species, as *G. acaulis*, *G. nivālis*, and *G. verna*, are among the most conspicuous and ornamental of European Alpine plants. America has several attractive species.

Yellow Gentian (*Gentiana lutĕa*).

Gentianaceæ (jen-shan-ā'se-ē), the gentians, an order of monopetalous exogens, consisting mostly of annual or perennial herbaceous plants, with opposite often connate entire leaves, and yellow, red, blue, or white flowers, which are borne in dichotomous or trichotomous cymes or in globose terminal heads. All are characterized by their bitter principle. The order contains about 520 species, which are widely dispersed throughout the world, occurring most plentifully in temperate mountainous regions. Some very handsome species are tropical, while a few occur in Arctic latitudes.

Gentile (jen'tīl), in Scripture, any one belonging to the non-Jewish nations and not a Christian; a heathen. The Hebrews included in the term *goim*, or nations, all the tribes of men who had not received the true faith, and were not circumcised. The Christians translated *Goim* by the L. *gentes*, nations, and imitated the Jews in giving the name *gentiles* to all nations who were not Jews or Christians. In civil affairs the denomination was given to all nations who were not Romans.

Gentleman (jen'tl-man), in English law, every man above the rank of yeomen, including noblemen; in a more limited sense, a man who without a title bears a coat of arms, or one who is 'a gentleman by reputation,' through belonging to some liberal profession or holding some office giving him this rank. In the United States it properly indicates a man of gentle or refined manners, but has lost this sense in its very general application.

Gentlemen-at-Arms, a body of forty gentlemen, headed by a captain, lieutenant, and standard-bearer, whose duties are to form a bodyguard to the British sovereign on state occasions. The corps was established by Henry VIII in 1509, under the name of the Band of Gentlemen Pensioners. Appointments to the corps are made by the sovereign, from a special list of retired officers kept by the commander-in-chief.

Gentoo (jen-tō'), a term applied by old writers to a native of Hindustan, or to the language.

Gentz (gents), Friedrich Von, a German diplomatist and publicist, born 1764; died 1832. He was

secretary to the directory of finances at Berlin when the French Revolution broke out, of which he was an ardent opponent. He served alternately in the Prussian and Austrian civil service, and his pamphlets and manifestoes proved formidable obstacles to the invasions of Napoleon. He took part in the congresses of Vienna and Paris, as well as in others. Among his various works was a life of *Mary, Queen of Scots.*

Genuflexion (jen-ū-flek'shun; from the Latin *genu*, knee, and *flectere*, to bend), the act of bending the knees in worship. There are frequent allusions to genuflexion in the Old and New Testaments, and it would appear that the use was continued among the early Christians. Genuflexion obtains, both by rule and prescription, in various places in the offices of the Roman Catholic Church, and at different parts of the services of the Church of England.

Genus (jē'nus), in scientific classification, an assemblage of species possessing certain characters in common, by which they are distinguished from all others. It is subordinate to *order*, *tribe*, and *family*. A single species, possessing certain peculiar characters which belong to no other species, may also constitute a genus, as the giraffe.

Geodes (jē'ōdz), round hollow nodules, containing sometimes earthy matters, sometimes a deposit of agate, sometimes quartz and spars crystallized. They are found more or less in all volcanic rocks, and have been formed by water depositing their materials in the hollows of those rocks.

Geodesy (jē-od'e-si), the science of surveying extended to large tracts of country; the branch of applied mathematics which determines the general figure and dimensions of the earth, the variations of the intensity of gravity in different regions, etc., by means of direct observation and measurement. See *Trigonometrical Survey.*

Geoffrey of Monmouth (jef'rā; called also *Geoffrey ap Arthur*), an ecclesiastic and historian of the twelfth century. He sprang from the Norman settlers in Wales; became archdeacon of Monmouth, whence he was, in 1152, raised to the bishopric of St. Asaph. He died in 1154. His famous history was first published in 1128. This *Chronicon sive Historia Britonum* is now known to be, as the compiler states, chiefly a translation from an ancient book in the Breton tongue, discovered by Walter Calenius, an archdeacon of Oxford. It contains a pretended genealogy of the kings of Britain from the time of the fabulous Brutus, or Brute, the Trojan, to the death of Cadwallader, King of Wessex, in 688. It was soon translated into French, English, and Welsh, and became a great source of romance to the writers of successive generations.

Geoffroy St. Hilaire (zhof-rwȧ saṇ tē-lār), ETIENNE, a French naturalist, born in 1772; died in 1844. He was educated at the colleges of Navarre and Lemoine, and became a favorite pupil of Haüy. At the age of twenty-one he obtained the chair of zoology in the Parisian Jardin des Plantes. As a member of the Egyptian expedition in 1798 he founded the Institute of Cairo, and returned about the end of 1801 with a rich collection of zoological specimens. In 1807 he was made a member of the Institute, and in 1809 professor of zoology at the Faculty of Sciences. He devoted himself especially to the philosophy of natural history. The fundamental idea brought conspicuously forward in all his works is, that in the organization of animals there is only one general plan, one original type, which is modified in particular points so as to present differences of genera. This view met with strong opposition from Cuvier. Among his principal works are *Sur le Principe de l'Unité de Composition Organique; Philosophie Anatomique; Histoire Naturelle des Mammifères*, written in conjunction with Cuvier, and *Notions de Philosophie Naturelle* (1838).

Geoffroy St. Hilaire, ISIDORE, physiologist and naturalist, son of the preceding, was born at Paris in 1805; died in 1861. He devoted himself to natural history, and in 1824 was appointed assistant to his father at the Jardin des Plantes. He was elected to the Academy of Sciences in 1833, and afterwards became successively inspector-general of the university, member of the council of public instruction, and professor of zoology at the Academy of Sciences. One of his chief works, *Histoire Générale et Particulière des Anomalies de l'Organisation chez l'Homme et les Animaux*, adds valuable confirmation to the theories of his father. He was the means of founding the Acclimatization Society of Paris.

Geognosy (jē-og'nu-si), a term which originated among the German mineralogists, and is nearly synonymous with *geology*. It is the science of the substances which compose the earth or its crust, their structure, position, relative situation and properties.

Geographical Societies (jē-o-grof'-i-kal) are associations formed with the view of obtaining and disseminating geographical knowledge. Of these, the first was founded in Paris in 1821; the second, the Royal Geographical Society of England, in 1830; the American Geographical Society at New York in 1852, and others elsewhere at various dates. The National Geographic Society, founded at Washington in 1888, has an enormous membership, numbering considerably over 100,000 due to the circulation of its richly illustrated monthly magazine.

Geography (jē-og'-ra-fi; from the Greek *gē*, earth, and *graphō*, I write), the science which treats of the world and its inhabitants, giving an account of the earth as a whole, and of the divisions of its surface, natural and artificial, describing the different countries, states, provinces, islands, cities, etc. It may be regarded as embracing several departments or branches. *Mathematical Geography* is that branch of the general science which is derived from the application of mathematical truths to the figure of the earth, and which determines the relative positions of places, their longitudes and latitudes, the different lines and circles imagined to be drawn upon the earth's surface, their measurement, distance, etc. *Physical Geography* treats of the physical condition of the earth, its great natural divisions of land and water, the atmosphere, and the movements of oceanic and aërial currents; the geological structure of the earth; and the natural products of the earth, vegetable and animal. It is concerned chiefly with general laws and principles, as they are manifested upon a grand scale, and in the organic kingdom with the existence of groups of animals and plants. This branch approaches at various points the sciences of geology, hydrology, meteorology, botany, zoology, and ethnology. *Political Geography* embraces the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and treats of their government, laws, social organizations, etc. *Commercial Geography* has to do with the distribution of the products of the earth or the workship between different nations.

The earliest idea of the earth formed by mankind seems to have been that it was an immense disc, in the center of which their own land was situated, surrounded by the ocean, and covered by the sky as with a canopy. The Phœnicians were the first people who made any great progress in extending the bounds of geographical knowledge. They seem to have explored all the shores of the Mediterranean, and at an early period to have passed the Pillars of Hercules (by the Strait of Gibraltar), and visited to some extent the Atlantic shores of Europe and Africa, extending their voyages as far north as Britain, and as far south as the Tropic of Capricorn. In the Homeric poems (which may be regarded as representative of the ideas entertained by the Greeks about the commencement of the ninth century B. C.) the earth is supposed to resemble a circular shield surrounded by a belt of water which was the source of all other streams. The world of Herodotus (born 484 B.C.) extended from the Atlantic to the western boundary of Persia, and from the Red Sea or Indian Ocean to the amber lands of the Baltic. The Indian expedition of Alexander the Great (330 B.C.) greatly enlarged the ancient knowledge of Northern and Eastern Asia. About 320 B.C. Pytheas, a seaman of Massilia (ancient Marseilles), a Greek colony, sailed along the western coasts of Spain and Gaul, visited Britain, and, pursuing his voyage, discovered an island, henceforward famous as *Ultima Thule*, which is supposed to have been Iceland. Eratosthenes (276-196 B.C.) first used parallels of latitude and longitude, and constructed maps on mathematical principles. He considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one center. The *Geography* of Strabo, a Greek of Pontus, written about the beginning of the Christian era, embodies all that was known of the science at that period. The countries lying round the Mediterranean were known with tolerable accuracy, but the Atlantic shores of Europe were very vaguely comprehended, while of the northern and eastern portions the most erroneous notions prevailed. Pomponius Mela, an early Roman geographer, wrote about the time of the Emperor Claudius. He divided the world into two hemispheres, the Northern or known and the Southern or unknown; the former comprising Europe N. of the Mediterranean and W. of the Tanais (Don); Africa S. of the Mediterranean and W. of the Nile; and Asia. The next famous geographer is Ptolemy, who lived at Alexandria about the middle of the second century A.D. In Europe, Spain and Gaul were now correctly delineated, together with the southern shores of Britain. Northern Germany and the southern shores of the Baltic were pretty well known, as also some portion of Russia in the neighbor-

hood of that sea, and the southern part of European Russia. In Asia it was considered certain that there were wide regions inhabited by nomadic tribes called Scythians, while from the far east came some vague reports of China. The *Geography* of Ptolemy remained the acknowledged authority during the whole of the middle ages. From his time up till the thirteenth century no advance was made in geographical knowledge until Marco Polo opened up new fields of inquiry. The account of his travels first made known to Europe the existence of Japan and of many of the East Indian islands and countries. Then followed the discovery of America in 1492, and from this time forward the progress of discovery was extremely rapid. In 1497 the Cape of Good Hope was doubled by Vasco da Gama, four years after its discovery by Bartholomew Diaz. Within thirty years from the date of the first voyage of Columbus the whole of the east coast of America from Greenland to Cape Horn had been explored. In 1520 Magellan passed the straits which bear his name, and his vessel, crossing the Pacific and Indian Oceans, returned to Europe by way of the Cape of Good Hope, being the first that had circumnavigated the globe. The west coast of America was explored as far as the Bay of San Francisco about the middle of the sixteenth century. At the same time discovery in the east advanced with rapid strides. Within twenty years of Gama's arrival in India the coasts of East Africa, Arabia, Persia, and Hindustan had been explored, and many of the islands of the great Archipelago discovered. The expeditions of Willoughby and Frobisher in 1553 and 1576, of Davis in 1585, of Hudson in 1607, and of Baffin in 1616, though they failed in their object of finding a N. W. passage to India, materially enlarged our knowledge of the Arctic regions. By the middle of the seventeenth century the Dutch, under Tasman and Van Diemen, made the Australasian Islands known to the world. Late in the following century Captain Cook added largely to geographical knowledge by his survey of the Pacific and its innumerable islands. The Antarctic continent was discovered in 1840 by American, English, and French expeditions, and the northwest passage round North America was found by McClure in 1850. The travels of Humboldt, Spix and Martius, Lewis and Clark, Fremont, and others have made us acquainted with the general features of the American continent. In Asia numerous travelers have contributed much to render our knowledge certain and precise in respect to a great part of the continent. The interior of Australia has been explored by Sturt, Eyre, Leichhardt, Burke, Wills, King, McDouall Stuart, etc. The opening up of the African interior was materially advanced by the explorations of a host of travelers, including Bruce, Park, Denham, Clapperton, the Landers, Burton, Speke, Grant, Baker, Barth, Livingstone, Rohlfs, Schweinfurth, Cameron, Stanley, etc., and now is almost as well known as that of Europe and America. Within the present century great advances have been made in Arctic geography, the site of the North Pole having been reached in 1909 and that of the South Pole in 1911. The progress which has marked recent discovery has been materially assisted by the governments of various countries, and by the numerous geographical societies formed during the nineteenth century. The scientific study and teaching of geography are becoming more and more recognized to be of high importance, and in both at present Germany takes the lead. See also *Geographical Societies*, the articles on the different countries, and such articles as *Earth*, *Climate*, etc.

Geok Tepe (gök-te'pe), a town and fortress of Central Asia, oasis of the Akhal-Tekke-Turkomans, lon. 58° E., lat. 38° N. In 1879 the Russians under General Lomakine were defeated here with heavy loss, but in January, 1881, it was stormed by General Skobeleff after a three weeks' siege, when about 8,000 fugitives were massacred, no quarter being given.

Geological Surveys (jē-ol-oj'i-kal). Active efforts have been made by the states of this country to obtain a just idea of their geological conditions, the first movement being made by North Carolina in 1823, followed by Massachusetts in 1830, and by 11 more states in the succeeding decade, while by the end of the century nearly all the states had entered upon a systematic investigation of their rocks and minerals. Pennsylvania, New York, New Jersey, and some of the Eastern states did this work with a large degree of completeness. The United States government early entered upon similar work, sending out numerous expeditions, and a United States Geological Survey was organized in 1879, which diligently continued the work, its field of operations embracing the whole country. Great Britain was the first country in Europe to engage in a similar work, beginning in 1832. It has been followed by nearly all the countries of Europe and by its several colonies.

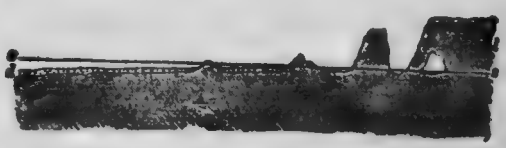
Geology (jē-ol'ō-ji; Gr. *gē*, the earth, *logos*, a discourse) is the science which treats of the history of the earth, as ascertained by the study of its exterior or crust, investigating the successive changes which have taken place in the rock-masses composing it, their relations, structure and origin, and discussing also the main features of the animal and vegetable life of the past as bearing on the earth's history. The present condition and conformation of the earth is the result of vast changes in the past and of agencies working through

Section of River Terraces, showing Successive Levels of Flood Plains.

immense periods of time, and the same or similar agencies may still be seen at work producing similar changes. Thus rocks, both aqueous and igneous, are still being formed. The former receive their name from owing their origin mainly to water, which acts both chemically and mechanically on the crust of the earth, in wearing down rocks and soils and carrying the débris often to considerable distances. The sediments thus carried to sea, or into lakes and estuaries, are spread abroad in the water, and form stratified deposits, which in course of time solidify into rock. With sufficient time all land would thus be eventually degraded beneath the sea, were it not that the loss is compensated by disturbance and elevation of land always slowly taking place over great portions of the continents and islands of the world. Such disturbances have produced strange phenomena among the stratified rocks, which may be contorted, tilted up, dislocated, or otherwise changed in their original arrangement. The strata resulting from aqueous deposits are consolidated (petrified) chiefly by pressure and chemical decomposition and recomposition. Some formations are many thousands of feet in thickness. Contraction of the crust of the earth due to radiation of the heat of the earth into space has also had immense effects, the result being that over broad areas rocky masses have been contorted and compressed to a great degree, and mountain ranges upheaved.

Igneous rocks also form a considerable portion of the visible crust of the earth, though much smaller in amount than those of sedimentary origin. Some of the igneous rocks consist of beds of volcanic ashes, others of old lavas, others of masses of matter which were introduced in a melted state from below among the strata. Granite is the most important and widely-spread of the igneous rocks, and is generally regarded as the fundamental rock of the earth's crust. Rocks that have been melted are known to be igneous by their structure, and also by the effects they have produced on the strata with which they are associated. Shales, sandstones, etc., are often hardened, bleached, and even vitrified at the points of junction with greenstone, basaltic, and felspathic dykes, or old lava beds, and the same kind of alteration takes place on a greater scale when large masses of igneous rocks have been intruded on the strata.

That the rocks which form the crust of the earth had the same general origin with the igneous rocks and sedimentary strata now forming has been well established, and that there is a regular succession of strata from the older to the newer, the oldest being normally lowermost, the newest uppermost, is also well ascertained. A corresponding succession in regard to the animal and vegetable life of former ages has also been proved by the fossils that accompany the successive strata. This *superposition of strata* and *the succession of life in time* are two cardinal doctrines in geology. Observation and experiment alike establish the doctrine of superposition. Thus at the edges of the strata on which London stands the rocks known as the Woolwich and Reading beds are *seen* to lie on the chalk. Far within these edges well-sinkers are aware that often after sinking several hundred feet through the London clay the chalk is reached. In like manner proceeding westward across the middle of England, it is found that



Section of Submarine Plain.

l, Land cut into caves, tunnels, sea-stacks, reefs, and skerries by the waves, and reduced to a platform below the level of the sea (*s s*) on which the gravel, sand, and mud (*d*) produced by the waste of the coast may accumulate.

the Chalk rests on the Greensands, the Greensands on the Upper Oolites, the Lower Oolites on the Lias, the Lias on the New Red marl, and so on through lower members of the geological series of English rocks. Similar conditions

may be found in all other countries, the superposition of strata being widely evident. Each great group of rocks consists of several subdivisions called *formations*, and each group, and even to a considerable extent minor subdivision, is characterized by the presence of distinct assemblages of organic remains. The successive appearance of such remains, which constitutes *the succession of life in time*, was the great discovery of Wm. Smith, made more than a century ago. The main rock-systems into which the earth's crust is divided, and which are based on the characteristics of the organic remains contained in them, are shown in the following table in ascending order:

Life Periods.	Rock Systems.	
Post-Tertiary or Quaternary	Recent—Alluvium, Peat, etc.	
	Pleistocene.	
Tertiary or Kainozoic	Pliocene.	
	Miocene.	
	Oligocene.	
	Eocene.	
Secondary or Mesozoic	Cretaceous.	
	Jurassic	Oolitic.
		Liassic.
	Triassic.	
Primary or Palæozoic	Permian.	
	Carboniferous.	
	Devonian.	
	Silurian.	
	Cambrian.	
Archæan, Laurentian, or Eozoic	Fundamental Gneiss.	

Igneus rocks also are associated in different localities with the systems named in the foregoing table.

In the small area of Great Britain a more complete series of rocks exists than in any other part of the earth's surface of equal dimensions—so far as is known. The greater part of the European series is, indeed, nearly complete in England and Wales alone; and since the days of William Smith, the British rocks, from this early and complete study, have generally been the types to which formations in other parts of the world were referred.

Archæan, Pre-Cambrian, or *Laurentian Rocks.*—The *Laurentian* are the oldest known of the sedimentary rocks. They are *metamorphic* (that is, changed from their original structure), and mostly gneissic in character, and were for long classed as granitic and igneous rocks till their true nature was shown by Sir William Logan. They occupy vast tracts of country in Labrador and Canada, consisting there of two divisions, *Lower* and *Upper Laurentian.* The gneiss of the lower division is interstratified with several thick banks of crystalline limestone, in one of which was found a structure believed by Dawson, Carpenter, and others to be a foraminifer and called *Eozoon Canadense.* It is now, however, generally believed to be a mineral product. In the Outer Hebrides and on the west coast of the North Highlands, rocks occur of highly metamorphic gneiss, which are probably of Laurentian age. The term *Pre-Cambrian* or *Archæan* is now applied to these rocks in the British area; they crop out also in North and South Wales, in the Malvern Hills, and in Charnwood Forest in Leicestershire. No fossils have yet been observed in these rocks. The *Huronian Rocks* of North America are possibly intermediate in age between the Laurentian and the rocks next mentioned.

Cambrian.—These rocks come next in succession to the Laurentian strata. The term Cambrian has been used differently by different geologists. The purple grits and slates to which the term Cambrian was restricted by Murchison form the greater part of the group of hills in Wales that lie east of Cardigan Bay; they are also well seen in Carnarvonshire, where the celebrated slate quarries of Penrhyn and Llanberis lie in Cambrian strata. Parallel strata, known by the same name, are found abundantly in other parts of the earth. Many of the beds are destitute of fossils, but these occur in certain localities down to the lowest beds of the system, and include brachiopods, trilobites, and other low organisms.

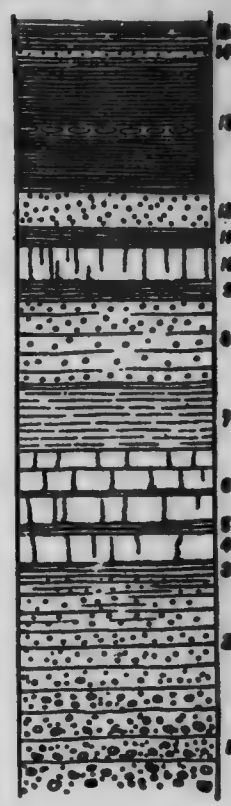
Normal Faults.

The *Silurian Rocks* were first worked out in detail in South Wales and the bordering counties by Sir Roderick Murchison, and an account of them published in the year 1839 in his *Silurian System.* They are divided by geologists into the *Lower* and *Upper Silurian.* The former comprises in ascending order the *Lingula beds* (so named from a characteristic fossil shell), the *Tremadoc slate,* the *Llandeilo flags,* and the *Caradoc* or *Bala beds.* The Lingula flags (*Potsdam sandstone* of the United States) rest conformably on and in fact pass by gradations into the Cambrian rocks. Above them lie the Llandeilo flags of North Wales, named from the town of Llandeilo in Carmarthenshire, where they

occur in a typical form. Above and passing into these lie the Caradoc or Bala beds (*Trenton limestone* of United States). The most characteristic fossils of the Lower Silurian are the crustaceans known as trilobites, of which more than 200 species are known to belong to these rocks. Other fossils include hydrozoa, corals, echinodermata, numerous mollusca (brachiopods in particular, also lamellibranchiates, pteropods, gasteropods, cephalopods or cuttlefishes). No fishes nor any other vertebrate animals have yet been found in the Lower Silurian rocks. In the United States the Upper Silurian include the *Oriskany* and *Niagara* beds; in Britain occur a number of successive beds, from the *Pentamerus* to the *Ludlow*. All the formations are in general terms fossiliferous, repeating the organisms of the Cambrian, and also having in their upper strata the earliest indications of the fishes, consisting of small teeth and scales of placoid fishes.

Old Red Sandstone and Devonian.—The *Old Red Sandstone* first received that name in contradistinction to the *New Red Sandstone*, the former occurring below and the latter above the Carboniferous strata. Where the uppermost Silurian strata join the Old Red Sandstone there is a gradual passage between them. A broad belt of Old Red Sandstone crosses Scotland in a north-east direction between the Firth of Clyde and Montrose and Stonehaven, and it occurs elsewhere in that country and in various parts of England. The Scotch beds were first carefully studied by Hugh Miller, who discovered in them remarkable fish forms (the Pterichthys, Cephalaspis, etc.). The absence of marine shells and the nature of the fossil fishes of the Old Red Sandstone of Great Britain indicate that the formation was deposited not in the sea, but in a great fresh-water lake, or in a series of lakes, for the nearest living analogues of many of the fish are the Polypterus of the African rivers, the Ceratodus of Australia, and in less degree the Lepidosteus of North America. In Canada, the sandstones of Gaspé are of Devonian age, as is found by their containing Cephalaspis.

The name *Devonian* has been given to a series of rocks in Devonshire bearing fossils intermediate in character between those of the Upper Silurian and those of the Carboniferous limestone, and which are considered as the equivalents of the Old Red Sandstone of the west of England and of Scotland. The terms Devonian and Old Red Sandstone are thus generally considered equivalent in point of time, and, though first found and studied in Britain, are now known in many parts of the world. These rocks have been divided into *Lower*, *Middle*, and *Upper Devonian*. The lower beds chiefly consist of slaty beds and green and purple sandstones, with brachiopods. The middle group, which includes the Plymouth limestone, contains numerous corals. The Upper Devonian group contains land plants (Stigmaria, etc., and many shells), some of which are identical with those found in the Lower Carboniferous limestone-shales.



Section showing Alternation of Beds.

15. Shale. 14. Seam of sandstone. 13. Shale with septarian nodules. 12. Sandstone. 11. Mudstone. 10. Limestone. 9. Clay. 8. Sandstones. 7. Sandy clays. 6. Limestone with parting of shale. 5. Shale. 4. Limestone. 3. Shale with cement-stone passing down into sandstone (2), which graduates into fine conglomerate (1).

Carboniferous Rocks.—In the south and middle of England, and in Ireland, the *Carboniferous Rocks*, so named on account of the masses of coal contained in them, consist chiefly of limestone at the base and Coal-measures above.

The Coal-measure beds consist of alternations of sandstone, shale, fire-clay or underclay, coal, and ironstone. Underneath each bed of coal is a bed of underclay with the roots known as Stigmariæ, forming the soil in which the plants were rooted, by the decay of which, passing into peat, material was supplied for the production of coal. These coal-bearing beds are numerous in England, where they have long been worked, their abundant product being the basis of the great industrial progress of that country. In the Carboniferous rocks more than 500

species of fossil plants have been named, a large proportion of which are ferns, including some tree-ferns. The remaining chief plants are gigantic club mosses known as Calamites, Lepidodendron, and Sigillaria. Coniferous trees also occur, as do the wings and wing-cases of beetles and other insects, spiders, etc., and large amphibian land animals. In the purely marine series of rocks, of which the Carboniferous limestone forms the most important part, we find corals, very numerous crinoids, brachiopods also exceedingly numerous, and Lamellibranchiate molluscs. Many cuttlefishes and numerous fish also occur, the latter including great sharks; trilobites are scarce. The greatest known development of the Carboniferous strata is in the United States, in which the beds spread over a vast area of country, and yield an enormous output of coal. They occur also widely in China (though as yet little worked), and to some extent in all the continents and many of the countries of the earth.

PASSAGE OF GRANITE UPWARDS INTO SOIL.
a, solid blocks. *b*, rounded blocks. *c*, soil.

The *Permian* series succeeds the Carboniferous rocks, and were long considered as part of the New Red Sandstone. They were named *Permian* by Sir Roderick Murchison, from the government of Perm, in European Russia, where they largely occur. They consist of sandstone, red marl, etc., and contain a bed of the magnesian limestone. The fossils of the Permian group are generically and specifically few in number, but as a whole their affinities and grouping are decidedly Palæozoic. All the Permian fish have heterocercal tails, like the majority of the Palæozoic genera, in which the vertebral column is prolonged into the upper lobe of the tail, whereas in the modern fishes the vertebral column is not prolonged into either lobe.

The *New Red Sandstone*, or *Trias*, succeeds the Permian strata. It has received the name of *Trias* from the fact that when fully developed, as in Germany, it consists of the three great divisions of *Keuper*, *Muschelkalk*, and *Bunter Sandstein*. Few old genera and no species pass thus far upwards. The majority of the genera of Brachiopoda disappear, and the whole grouping of the fossils now ceases to be Palæozoic, and assumes a character common to the Secondary rocks. In its greatest development in England, the Bunter series (of soft red sandstone and quartz conglomerate) is about 3000 feet thick. The Muschelkalk may be well seen, among other places, near Gotha, and at Eisenach in Thuringia. It is a gray, shelly limestone, rich in fossil molluscs. No fossils are known in the Bunter Sandstones of England, though a few are found in equivalent strata in Europe. The upper red marl (Upper Trias) varies from 500 to 2000 feet in thickness, and contains, besides other fossils, footprints and bones of reptiles. In the United States the Triassic rocks of Virginia and North Carolina contain workable beds of coal. The red sandstone of the Connecticut Valley is of Bunter age. Above the Keuper strata occur a series of beds called the *Rhætic beds*, from similar strata in the Rhætic Alps, and appear to be intermediate between the red marl and the next series of strata. At the bases of the Rhætic beds have been found minute teeth of the earliest known mammal (*Microlestes Rhæticus*), a small insect-eating marsupial.

The *Lias* and *Oolite* series succeed the New Red and Rhætic beds. On the continent of Europe the Lias and Oolite together are termed *Jurassic*, because in a typical form they are largely developed in the range of the Jura. The Lower Lias clay and lime, as a whole, is rich in the remains of life. These include crinoids, decapod crustaceans, Terebratulæ, and other Brachiopoda, and numerous Lamellibranchiate molluscs. Cephalopoda, such as ammonites and belemnites, are specially numerous, together with species of nautilus. Fish are numerous and there appear in the Lower Lias a great number of remarkable reptiles, some of gigantic size, as the Ichthyosaurus, the Plesiosaurus, and the well-known Pterodactyle. The *Marlstone* series, or *Middle Lias*, which is generally a brown, ferruginous, soft, sandy rock, is rich in many forms of ammonite and belemnite, etc. From the *Upper Lias clay* much alum shale, as also the well-known Whitby jet, is obtained. It is a stiff, unfertile, dark-blue clay.

The *Oolitic* strata as a whole stretch across England from southwest to northwest, or from Portland Bill to North Yorkshire. The *Inferior Oolite*, the lowest member of the Lower Oolite, chiefly consists of beds of yellow limestone. Much of the limestone is oolitic, that is to say, it is formed of small concretionary bodies, like the roe of a fish, cemented to-

gether in a calcareous matrix. Among fossils of the Bath or Great Oolite, which succeed that mentioned, are reptiles of the genera Teleosaurus and Megalosaurus, together with the gigantic Cetiosaurus (or whale-lizard), probably about 50 feet in length. During this part of the Oolitic epoch, while in the south of England the strata were exclusively marine, in the middle and north they were to a great extent estuarine, fresh-water, and terrestrial.

The *Middle* and *Upper Oolite* succeed, and are locally divided into many beds, an important section of the *Upper* being the Portland limestone, found especially in the isle of Portland, and used as a favorite building stone. The celebrated Portland stone has been employed in many public buildings, including St. Paul's. Like those of all the other Oolite formations it is cream-colored, and generally fossiliferous. Oolitic rocks, known by the name of *Jurassic*, almost identical with those of Britain, occur largely in France; and the mountain range of the Jura, dividing France and Switzerland, is chiefly formed of Liassic and Oolitic rocks. From thence they range interruptedly northwards and eastwards, covering a large part of the plains of European Russia, and extending along the Himalayas.

As regards the fossil remains of the Lias and Oolite, a remarkable feature is the vast development of Cephalopoda, especially of the genera *Belemnites*, *Nautilus*, *Ammonites*, and *Ancyloceras*. There are also many genera and species of fishes, chiefly in the Lias, and the genera and species of reptiles are so numerous that this life-period has been sometimes called 'the age of reptiles.' The plants include ferns, horsetails, conifers, cycads, etc. Viewed as a whole, the Liassic and Oolitic strata seem to have been deposited in warm seas round groups of islands formed of the older Palæozoic rocks of Europe. Succeeding them is a series of transition strata, known as the *Purbeck* and *Wealden*, developed in several localities and leading upward to the cretaceous rocks.

The *Cretaceous Formation* is divided into a lower and an upper series of strata, comprising in England the *Lower Greensand*, the *Gault*, and the *Upper Greensand*. It derives its name from the *Chalk*, a sort of soft, white limestone, which occurs in thick beds in Europe and Asia, covering an enormous area. On examination with the microscope, much of it is found to consist of the shells of Foraminifera, Diatomacea, spiculæ and other remains of sponges, Polyzoa, and shells, highly comminuted. Somewhat similar deposits are now forming in the open Atlantic at great depths, chiefly of Foraminifera of the genus *Globigerina*. Plants are comparatively few in the Chalk, but animal remains are very numerous. More than eighty species of fish are known; various great reptile forms, as the Mosasaurus, Plesiosaurus, and Ichthyosaurus, Pterodactyles, etc. In America the Cretaceous epoch presents some extraordinary reptilian forms of immense size, also various birds. The sands and marls of New Jersey, are of this age, and similar beds occupy extensive tracts in the western regions; but there is no true white chalk in America.

Of the *Tertiary* strata the *Eocene Rocks* form the lowest division. The strata are divided into the Lower Eocene and the Upper Eocene or *Oligocene*. The Lower Eocene rocks lie sometimes on upper beds of Chalk, and sometimes on beds lower in the series. They are therefore highly *unconformable*, and in this we have the reason of the complete difference in the species of the Cretaceous and Eocene rocks, for great continental areas of Chalk were upheaved above the sea, and remained as dry land for a period of time so long that when they were again submerged the life of Cretaceous times had died out, and other forms appeared. Remains occur of birds allied to the vulture and kingfisher, and a small swimming-bird with tooth-like serratures on the bill; turtles and river tortoises are numerous. In the Upper Eocene or Oligocene various Ungulate mammalia are found, such as the Anoplotherium, Palæotherium, a kind of river-hog, tapirs, etc. In France, in the Paris basin, the Eocene strata are largely developed. The Wahsatch, Bridger and Uinta beds of North America are of Eocene age.

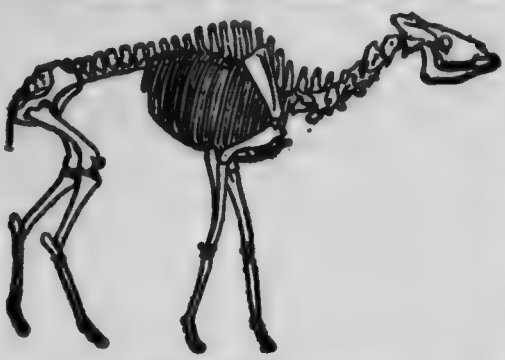
PASSAGE OF SANDSTONE UPWARDS INTO SOIL.
a, solid sandstone.
b, broken-up sandstone.
c, earthy layer.

The *Miocene Rocks* are well represented by strata (mostly of fresh-water origin) in Central France (Auvergne, etc.) and Switzerland. Over many parts of Europe, Asia, and America there are other Miocene strata, each more or less possessing peculiarities. They show a

marked progression in mammalian forms over those of the Eocene, showing a distinct and decided evolution.

The *Pliocene* strata contain many fossils indicative of still greater progress and approaching somewhat closely to the animal forms of modern date. They include remains of species of mastodon, elephant, hippopotamus, and horse, as also of the common otter, deer, etc., of a character showing that the dawn of the recent period is near at hand.

The *Post-tertiary* or *Quaternary* Epoch is that immediately before the period in which we are now (the *recent*). It is characterized especially by various glacial phenomena, and in particular by numerous evidences of a glacial period, when the northern hemisphere was subjected to a climate of the utmost rigor, and much of it buried under beds of glacier ice, probably as thick as that of the north of Greenland at the present day. (See



HELLADOTHERIUM DUVERNOYI.
An extinct member of the giraffe family.

Glaciers.) It is believed that subsequently a slow withdrawal of the glaciers took place, leaving behind them beds of sand, gravel, and clay, full of boulders and ice-scratched stones, intermingled with shells of Arctic or semi-arctic type sometimes lying at heights of from 800 to 1200 and 1400 feet above the present sea-level. These phenomena are more or less universal over great part of Northern Europe and North America. Among Post-tertiary plants there are Scotch firs, pines, yews, oaks, alders. The mammalian remains include those of elephants, rhinoceroses, hippopotamus, the common horse, bison, aurochs, red deer, roe-deer, Irish elk, Machairodus (a tiger?), etc. Many of these animal remains are found in the celebrated *bone caves*, several notable examples of which have been investigated. (See *Cave.*) In these have been found not only such remains as those of the cave bear, cave hyæna, fox, wolf, cat, lion, reindeer, Irish elk, bison, rhinoceros, elephant, etc., but also the works of man, such as flint implements, and in some localities human skulls and other bones associated with the above-named mammalia. When the ice had fully passed away the *recent* period began, distinguished by the presence of man and of the lower animals which still exist, and marked by few and minor geological changes.

Geometrical Mean, the second of the terms of a geometrical progression containing three terms. The geometrical mean of two numbers is equal to the square root of their product. See next article.

Geometrical Progression, a series of numbers which increase or decrease by equal ratios; as, 2, 4, 8, 16, or 16, 8, 4, 2.

Geometry (jē-om'e-tri; Greek *gē*, earth, and *metron*, measure), as its name implies, was primarily the mathematical science which has for its object the measurement of portions of the earth's surface; but now geometry may be termed the science which treats of the properties and relations of definite portions of space, such as surfaces, volumes, angles, lines. The relation between the parts of the same figure may be of two kinds,—of position or of magnitude; for example, two points in a straight line, four points on the same circle, two straight lines perpendicular to one another, a straight line tangent to a circle, are relations of position. On the other hand, the proportionality of homologous lines of two similar figures, the equality of the square constructed on the hypotenuse of a right-angled triangle to the sum of the squares constructed on the sides containing the right angle, that of the volumes of two pyramids on equal bases and of the same height, are relations of dimension. But the relations of position govern the relations of dimension, and *vice versa;* that is, the one set of relations depend upon the other. Thus it is because a triangle is rectangular that the square constructed on one of its sides is equivalent to the sum of the squares constructed on the other two, and, *vice versa*, that relation between the magnitudes of the squares on the three sides depends on the triangle being right-angled. The geometer may draw indifferently from the study of a figure either the knowledge of the relations of position or that of the relations of dimension, on the condition that he knows how to apply relations of the one kind to those of the other: and the principal aim of geometry is to examine into the connection between the

relations of magnitude and those of position.

Geometry may be conveniently divided into several principal sections—elementary geometry, practical geometry, analytical geometry, infinitesimal geometry, etc. *Elementary geometry* comprehends two parts—plane geometry, the object of which is the study of the simplest figures formed on a plane by straight lines and circles; and solid geometry or geometry of three dimensions, which treats of straight lines and planes considered in any relative position whatever, of figures terminated by planes, of the cylinder, of the cone, and of the sphere. *Analytical geometry*, either plane or solid, makes use of the method of coördinates introduced by Descartes and primarily applied to curves. In ancient times, though curves were studied and the principal properties of conic sections known, still no connection existed between these curves, nor was there any means of establishing one, so that the study of one was of no value to that of another. The first question in introducing the analytical method was then to fix upon some means which should serve to construct every curve by successive points as numerous and as closely brought together as is necessary in order to lay down the curve. Now the position of a point in a plane may be determined by two intersecting perpendiculars drawn from two fixed lines —the coördinate axes—at right angles to each other. An equation may then be found which states the relation between the coördinates of any point, that is, its distance from the two coördinate axes. (See *Coördinates.*) The study of the curves will thus be simply the study of their equations. In this way a typical equation for a curve in a certain system may be got, so that if at another time the curve is represented under another definition in investigating its equation in the same system of coördinates, particularized so as to simplify as much as possible the calculations, it will suffice to compare the particular equation with the general one to verify the identity of the curve, to give it its name, and to know all the properties of it which have been studied previously. In a similar way the analytical geometry of solid bodies is based on the fact that the position of any point in space can be determined by reference to three intersecting planes. *Infinitesimal geometry* is simply a continuation of the analytical geometry of Descartes, of which it may indeed be said it forms a part; the difference consists simply in the nature of the questions which, as they involve the measurement of magnitudes, the incessantly variable elements of which cannot be summed up by finite parts, require the use of the infinitesimal calculus. *Descriptive geometry* consists in the application of geometrical rules to the representation of the figures and the various relations of the forms of bodies according to certain conventional methods. In the descriptive geometry the situation of points in space is represented by their orthographical projections, on two planes at right angles to each other called the *planes of projection.*

History.—The origin of geometry is assigned by an ancient tradition to Egypt, but the history of the science, as far as it is known, commences in Greece with Thales (639-548 B.C.). To him is attributed the discovery of the properties of triangles. His disciple, Pythagoras (born about 580), founded a celebrated school in Italy where geometry was as highly honored as philosophy. He discovered the theorem of the square of the hypotenuse, thus completing, so to speak, the geometry of polygons. He was also the first to show that the circle contains a greater area than any plane figure having the same perimeter, and that the sphere contains the greatest volume bounded by a given surface. After him Anaxagoras, Hippocrates of Chios, Theodorus of Cyrene, and Archytas of Tarentum cultivated the science and have left names connected with various problems, but the next great development of the science is due to Plato and his disciples, who laid the foundation of the analytical method and developed the fundamental principles of geometrical *loci*. Euclid, who belonged to the famous school of Alexandria, and flourished about 285 B.C., has the merit of collecting and systematizing all the more important problems and theorems worked out by his predecessors, besides adding many new ones of his own. He also wrote various other mathematical works, a book of *Data*, a treatise on *Porisms*, etc., most of which have been lost. It is in his *Elements of Geometry*, which are still the favorite text-book, that the method of proof known as the *reductio ad absurdum* is first found. After Euclid came Archimedes (287-212 B.C.). Among his achievements are the determination of the ratio of the diameter of a circle to its circumference, and the investigation of the areas of the circle and parabola and other problems much more difficult than any previously attacked. Archimedes had completed that branch, the object of which is the comparison with each other of magnitudes of the same nature; Apol-

lonius (247 B.C.) made an analogous progress in that which treats specially of the properties of figures. His eight books of *Conics*, in which he considers these curves in the oblique cone, which had not been done until that time, contain almost all their interesting properties, those which relate to their foci, tangents, asymptotes, or diameters, and to their involutes. Eratosthenes, Nicomedes, the inventor of the conchoid; Hipparchus, who made some progress in spherical trigonometry Menelaus (80 A.D.); Ptolemy (125 A.D.), Pappus (390), and Proclus (440), continued the fame of the Alexandrine school. Diophantus introduced methods of an algebraic kind, and was the model on which the Arabic geometers, and Leonard of Pisa, Cardan, and finally Vieta formed themselves. He is thus the connecting link between the ancient and modern geometricians. After the sack of Alexandria and the burning of its library the science was confined to India and to the Arabic school of commentators, and it was not till the middle of the sixteenth century that geometry revived in Europe with Vieta (1540-1603), who introduced the use of algebraic symbols for the solution of geometrical problems. Trigonometry owes to him most of the elegant formulæ which now constitute it. In the writings of Kepler (1571-1631) we find the first applications among the moderns of the method of Exhaustions of Archimedes freed from the difficulties which had encumbered the geometry of the Greeks; and to Cavalieri (d. 1647) belongs the honor of an entirely new method for quadratures and cubatures. Descartes (1586-1650), developed Vieta's discoveries, created the science of analytical geometry, which greatly extended the domain of geometrical science. Fermat (1570-1633) and Barrow (1630-77) with their methods of tangents and of maximums; Huyghens (1629-95), with the theory of involutes, were on the road to the differential calculus, as Roberval, Pascal, and Wallis with their processes of summation were to the integral calculus. Newton (1642-1727) and the brothers Bernouilli (1654-1705, 1667-1748) made important contributions, such as the theorem on the generation of curves of the third order and the method of isoperimeters. About the beginning of the nineteenth century a decided advance was made by Monge (1746-1818) and Carnot (1753-1823). The Descriptive geometry of the former established the whole theory of projections. Carnot's first contribution to geometrical science was his principle of the *correlation of figures*, a principle which, having been farther generalized, is now known as the *principle of continuity*. His second contribution was his *theory of transversals*. On these inventions is founded *modern geometry*, which has revolutionized the science, and has given us generalised conceptions previously undreamed of. Amongst the later geometricians who have contributed to extend the methods and domain of the science we may mention Poncelet for his theory of reciprocal polars, Chasles for his treatise on porisms, etc.; Sir William Rowan Hamilton for his invention of quaternions, an entirely new method; Cayley and Sylvester for their application of generalised geometrical methods to space of more dimensions than three.

Geophagism (jē-of'a-jism), or DIRT-EATING, the practice of eating some kind of earthy matter, clay, chalk, etc., common amongst uncivilised peoples, such as the South American Ottamacs, the Indians of the Hudson Bay country, the West Indian blacks, the negroes in some of the United States of America, and others. In some cases it is probably used to allay hunger, but it is also practised where the supply of food is sufficient. Amongst chlorotic young women a similarly depraved appetite is not uncommon. Uncinariasis (hookworm disease) is sometimes produced by it, the hookworms getting into the blood through the intestines.

George, DUKE OF SAXONY (*the Bearded*), born in 1471; died in 1539; was the son of Albert the Brave, the founder of the Albertine line of Saxony, and succeeded in 1500 to the hereditary dominions of the Albertine house. Later on he became involved in the turmoils of the Reformation period. He was not at first wholly hostile to reform, but thought that it could be better effected by means of papal edicts than by the revolt of Luther. Accordingly he became embittered by the uncompromising tone of Luther's later writings, and endeavored to suppress the Reformation within his dominions by violent measures. These, however, were unsuccessful, and in 1539, on the accession of his brother Henry, who was a Protestant, the Reformation was successfully introduced into the dominions of the Albertine house of Saxony.

George, ST., a saint venerated both in the eastern and western churches, and the patron saint of England. He was canonized in 494 or 496 by Pope Gelasius. His origin is very obscure, one of many legends representing him as a prince of Cappadocia mar-

tyred by Diocletian. Gibbon has sought to identify this legendary saint with the notorious and turbulent Arian heretic George of Cappadocia, who was slain in 361 in a rising of the populace who had been infuriated by his oppression and his violence against pagans and orthodox. But the most eminent scholars, both Roman Catholic and Protestant, are of opinion that the veneration of St. George has been traced up to so early a period as to make it very improbable that a notorious Arian could have been foisted on the Catholic Church as a saint and martyr. The killing of a dragon that was about to swallow a maiden is a legendary feat attributed to him. He was adopted by the Genoese as their patron saint, and in 1222 the Council of Oxford ordered that his day (the 23d of April) should be observed as a national holiday in England; in 1350 he was made the patron of the order of the Garter by Edward III.

George, Order of St. The following are the principal of the numerous orders which have been founded in honor of St. George:—(1) A military order instituted in Russia in 1769 by the Empress Catharine II as a reward of military achievements. It consists of four classes, to which a fifth, intended for non-commissioned officers and privates, was added in 1807. (2) An order instituted in Bavaria by the Emperor Charles VII (Charles Albert) in 1729, and recognized by King Louis II in 1871. Since the reorganization the order, which had previously been a mere decoration for the nobility, has devoted itself to such services as the care of the wounded on battlefields, etc. (3) An order instituted by Ernest Augustus of Hanover in 1839. (4) A Sicilian military order, instituted by Joseph Napoleon, 24th February, 1808, and remodeled by King Ferdinand IV in 1819. (5) The name under which the order of the Garter was first instituted in England. See *Garter (Order of the)*.

George, St., one of the Bermudas. It is about 3 miles long and half a mile broad, is fortified, and contains a port of the same name, which is a British military station.

George, The, a badge exhibiting the figure of St. George encountering the dragon, worn pendent from the collar by the Knights of the Garter. See *Garter*.

George I, of Great Britain, and (George Louis), King Elector of Hanover, was the son of the Elector Ernest Augustus, by Sophia, daughter of Frederick, Elector Palatine, and grand[illegible]hter to James I. He was born Ma[illegible] 1660, and in 1682 was married to Sophia Dorothea of Zell, whom, in 1694, on account of a suspected intrigue with Count Königsmark, he caused to be imprisoned and kept in confinement for the rest of her life. In 1698 he succeeded his father as elector. He commanded the imperial army in 1707 during the war of the Spanish succession; and ascended the throne of Great Britain on the death of Queen Anne in 1714. Amongst the notable events of his reign were the rising of the Scottish Jacobites (1715-16); the Triple and Quadruple Alliances against Spain (1717 and 1718); and the failure of the South Sea Company (1720). He died in 1727. The private character of George I was bad, but he showed much good sense and prudence in government, especially of his German dominions. By Sophia Dorothea he had a son, George, afterwards George II of England, and a daughter, Sophia, the mother of Frederick the Great.

George II (George Augustus), King of Great Britain, son of George I, was born October 30, 1683. He married in 1705 Wilhelmina Carolina of Brandenburg-Anspach. In 1708, then only electoral prince of Hanover, he distinguished himself at Oudenarde under Marlborough. In 1727 he succeeded his father on the English throne, but inherited to the full the predilection of George I for Hanover. His reign is notable for the great events with which it is filled, and for the number of men great in art, letters, war, and diplomacy which then adorned England. The war of the Austrian succession, in which George II himself took part at Dettingen, the Jacobite rebellion of 1745, the conquest of Canada, and the growth of the British empire in India are amongst the chief events of his reign. George II died suddenly October 25, 1760. He was a prince of very moderate abilities, regardless of science or literature; of obstinate temper and vicious habits; but honest and open in his disposition.

George III, George William Frederick, King of Great Britain, born in 1738, was the eldest son of Frederick, Prince of Wales, [illegible] the Princess Augusta of Saxe-Gotha, and succeeded his grandfather, George II, in 1760. In the following year he married the Princess Charlotte Sophia of Mecklenburg-Strelitz. The sixty years of his reign were filled with great events, amongst which are the Wilkes controversy, the American Revolution, 1775-83; the French Revolution, 1789, and the

Irish rebellion, 1798, etc. George III, while conscientious, was mentally obtuse, and his narrow patriotism, his obstinate prejudices, and blind partialities were even more hurtful to British interests than the indifference of his predecessors had been. His tastes and amusements were plain and practical, literature and the fine arts receiving but a small share of his attention. His private life was very exemplary. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death on January 29, 1820, his biography is a blank.

George IV (GEORGE FREDERICK AUGUSTUS), King of Great Britain, son of George III and the Princess Charlotte of Mecklenburg-Strelitz, born in 1762; died June 26, 1830. His dissipated life, his extravagance, his supposed marriage with a Catholic, Mrs. Fitzherbert, alienated from him the affection of his father and the esteem of the nation. In 1795 he married the Princess Caroline of Brunswick, from whom he soon separated, and who was afterwards tried for adultery in 1820 and acquitted. In 1811 George became regent, and, on the death of George III in 1820, succeeded as king.

George V (FREDERICK ERNEST ALBERT), King of Great Britain, was born at Marlborough House, London, June 3, 1865. He was the second son of Edward, Prince of Wales, afterwards Edward VII. His elder brother, Duke of Clarence, died in 1892, leaving him heir to the throne, to which he succeeded on the death of his father, King Edward, May 6, 1910. The career of the new king as a prince was largely in the navy, which he entered at the age of 12, and continued until he reached the throne, passing through the several grades from midshipman in 1880 to rear-admiral, 1901, vice-admiral, 1903, and admiral, 1907. This progress in the navy was not made without regard to merit, as the sailor prince showed himself brave, ready and efficient on more than one critical occasion. In 1893 he married the Princess Victoria Mary, daughter of the Duke of Teck, and has six children, the oldest, Edward Albert, succeeding him as Prince of Wales. The sailor prince became Duke of Cornwall when his father took the throne, and soon after started on a tour of the colonies, opening the first parliament of the Commonwealth of Australia in 1901. In the fall of 1905 he went to India, and in 1908 visited Canada, to attend the celebration at Quebec, but did not visit the United States, as his father had done in a similar trip to Canada. George V differs from his father in several particulars. He does not share Edward's love of sports, is less approachable and more intellectual, and is devoted to home life. As a monarch, he has shown ability and decision, especially in his determination not to take the coronation oath in its old form of offensive allusion to the doctrines of his Catholic and non-conforming subjects. In 1911 he visited India, a step which no former British king had taken. The purpose of his visit was to be crowned emperor of this distant realm of the empire.

George I, 'King of the Hellenes,' was born at Copenhagen Dec. 24, 1845, second son of the king of Denmark. In 1863 he was elected king by the Greek National Assembly. In 1867 he married the Princess Olga, a niece of the Russian czar. His conduct as a constitutional monarch was correct and regular, and he won the popular sympathies by the efforts he made on behalf of the expansion of Greek nationality. He was fatally shot by an anarchist in Salonika, March 18, 1913, and was succeeded by his son, the crown prince Constantine, born August 2, 1868.

George, HENRY, political economist, was born at Philadelphia, Pennsylvania, in 1839. He wrote a number of works, the most famous being *Progress and Poverty*, upon which was based the doctrine maintained by the 'Single Tax' advocates, namely, that all land should belong to the state and pay a tax sufficient to meet all the expenses of the government. He was the author of several other works. He was twice nominated for mayor of New York, in September, 1886, and October, 1897; in the former he was defeated and he died suddenly during the heat of his canvass of the latter, October 29, 1897.

George, LAKE, a lake in New York state, between Warren and Washington Counties, south of Lake Champlain, into which it discharges at Ticonderoga. It is 36 miles long, and from ¾ mile to 4 miles in width. It is surrounded by lofty hills wooded to the top, has richly wooded shores, and many picturesque islands. Caldwell, Bolton, and other places on its banks are favorite resorts, and in summer large numbers of tourists are attracted by the beauties of its scenery. Here was fought a severe battle in 1755, in which the French and Indians were defeated by the English, and it was the scene of several other warlike events. Fort Ticonderoga lay between it and Lake Champlain.

George Junior Republic, a juvenile

community founded in 1895 near Ithaca, New York, by William R. George, as an experiment in the training of outlaw children of the slums in their future duties as American citizens. The children govern the community themselves under a system of municipal administration, and the experiment has been so successful that similar communities have been founded in other localities.

George-noble, a gold coin of the time of Henry VIII of the value of 6s. 8d. sterling ($1.60). It is so called from bearing on the reverse the figure of St. George killing the dragon.

George's Channel, St., the arm of the sea which separates Ireland from Wales south of the Irish Sea. From Holyhead and Dublin on the north to St. David's Head and Carnsore Point it extends about 100 miles, with a breadth varying from 50 to 70 miles. Its depth in the middle varies from 40 to 70 fathoms. The bottom is chiefly sand and gravel.

Georgetown (jorj'town), formerly a city of the District of Columbia, on the left bank of the Potomac, near the city of Washington; now a part of Washington, with which it was incorporated in 1878. It is beautifully situated on a range of hills, and abounds with villas and country seats. It contains the Georgetown University (the oldest Catholic college in the United States), the Peabody Library, etc. The Chesapeake and Ohio Canal commences here. Pop. 16,193, included in the District of Columbia.

Georgetown, or Demerara, the capital of British Guiana, at the mouth of the Demerara. It is neatly built, consisting of broad streets at right angles, with canals in the middle, and lofty wooden houses, often with luxuriant gardens attached. There is a bar at the mouth of the river, and large ships have to discharge and load by means of lighters. Georgetown is the seat of an Anglican bishop, and has a number of churches, schools, hospitals, etc. The chief exports are sugar, rum, and coffee. Pop. 53,176, of whom only one-tenth are whites.

Georgetown, county seat of Georgetown County, South Carolina, a port of entry at the head of Winyah Bay on Sampit River, 50 miles N. E. of Charleston. It has turpentine distilleries, saw mills, and other industries, and a trade in cotton, naval stores, lumber, fish, etc. Pop. 5530.

Georgetown University, an educational institution in Washington, D. C., founded in 1789 under the auspices of the Roman Catholic Church. It has about 850 students attending and 144 instructors in the faculty, and a library of over 100,000 volumes.

Georgia (jorj'i-a; by the Russians called *Grusia*, and by the natives themselves *Karthli*, was formerly a kingdom, but is now included in the Russian government of Tiflis, though the name is sometimes loosely employed to designate a much larger portion of the territory possessed by Russia south of the Caucasus. In the latter sense it has an area of say 34,000 square miles, but Georgia proper does not exceed about 15,000 square miles. The natives are a fine-looking race, the Georgian women, like the Circassians, being celebrated for their beauty. The Georgian language, together with that of the Mingrelians, Lazes, and other Caucasian peoples, seems, according to the latest researches, to form a perfectly distinct linguistic family. It possesses a not unimportant literature, commencing with the introduction of Christianity into the country. The history of the Georgians first becomes trustworthy about the time of Alexander the Great, to whom they became subject. About B.C. 324 they gained their independence under Pharnavas. They became Christianised towards the end of the fourth century. After yielding for a time to the supremacy of the Arabian caliphs Georgia regained its independence towards the end of the tenth century, which it retained till 1799, when Heraclius, successor of George XI, formally ceded his dominions to the Russian emperor Paul.

Georgia, one of the Southern United States, is bounded N. by Tennessee and North Carolina, E. by South Carolina and the Atlantic, S. by Florida, and W. by Alabama; length, north to south, 320 miles; breadth, 255 miles; area, 59,265 sq. miles (about the same as England and Wales). The coast is bordered by a chain of islands, separated from the mainland by narrow lagoons or sounds. On them the famous sea-island cotton is raised. The land is low towards the coast, beginning as a salt marsh, grown over with tall reeds, continuing next as swampy rice plantations and then as 'pine barrens' about 60 to 90 miles inland, whence it gradually rises as a sandy district, interspersed with fertile tracts, till it reaches the lower falls of the Savannah, Ogechee, Oconee, and other rivers. Here the hilly and finally mountainous region called the Upper Country begins, a fertile and salu-

brious region extending north and west till it rises into the Appalachian mountain chain, the highest peak in the state being 4821 feet. Along the coast and near the lower courses of the streams are rich alluvial districts, interspersed with meadows, which are suited to rice culture. In the southwestern part of the State is a large area which has long been justly celebrated for its cotton product, Georgia being next to Texas in its yield of cotton, averaging about 2,000,000 bales annually. Of the rivers, the Chattahoochee, which flows under the name of the Appalachicola into the Gulf of Mexico, is navigable for steamers for 300 miles; the Savannah is navigable for steamers part of the year for 250 miles; and the Altamaha and its affluents are navigable for small vessels 300 miles upwards. The climate is mild and pleasant, but unwholesome in the low parts of the country during the months of July, August, and September. The soil in many parts is very rich. Cotton and corn are the leading plantation products, and rice, with some sugar-cane, are staple crops in the lowlands. In addition, tobacco, the sweet potato, and other crops are cultivated with success. The fruits, which include peaches, apples, melons, oranges, bananas, etc., are of the finest and large quantities of them are shipped to the North. The chief minerals are granite, marble, iron ore, limestone, clay, asbestos, manganese, bauxite, some coal, gold, silver, lead, etc. Georgia ranks second (Vermont, first) in the production of granite in the United States. The pine forests furnish large supplies of lumber, rosin and turpentine. Of manufactures, the most important is the production of cotton goods, and of cotton-seed oil. Atlanta is the seat of the legislature and largest town; the other principal towns are Savannah (the chief seaport), Augusta, Macon, and Columbus.

A charter for the foundation of a colony in the territory now called Georgia was obtained in 1732 by General Oglethorpe from George II, after whom the state was named, his purpose being to colonize it with debtors taken from the London prisons. Georgia was one of the thirteen original states. In 1788 it adopted the constitution of the United States by a unanimous vote. In January, 1861, Georgia seceded with the Confederates, took an active part in the Civil war, and was conquered by a Federal army under General Sherman (1864-5) and restored to the Union. The history of Georgia in the last few years has been one of material progress. The National Expositions held at Atlanta in 1881 and 1895 were of great benefit to agricultural and manufacturing interests, which have rapidly developed. Pop. 2,609,121.

Georgia, Gulf of, a large gulf of the North Pacific Ocean, between the continent of North America and Vancouver's Island; about 120 miles in length from north to south; the breadth varies greatly in its different parts, from 6 miles to 20. It communicates with the ocean on the north by Queen Charlotte Sound, and on the south by the Strait of Juan de Fuca.

Georgia, South, an island in the South Atlantic, lat. at its north point 53° 57′ s.; lon. 38° 13′ w. It is 90 miles long, and has high and rocky coasts, inaccessible from ice during a great part of the year. It abounds with seals and sea-fowls.

Georgia Bark (*Pinckneya pubens*), a small tree of the Southern United States closely resembling the cinchona or Peruvian bark, and belonging to the natural order Cinchonaceæ. The corolla is tubular; the stamens five, with a single style; and the capsule contains two cells and numerous seeds. The wood is soft and unfit for use in the arts. The inner bark is extremely bitter, and is employed with success in intermittent fevers.

Georgian Bay, formerly called Lake Manitoulin, the northeastern part of Lake Huron, partly separated from the main body of the lake by the peninsula of Cabot's Head and the island of Great Manitoulin. It is about 120 miles long and 50 broad.

Georgievsk (gä-or′gē-efsk), a garrison town in the province of Terek, North Caucasia, Russia. It has a trade in silk and leather. Pop. 14,000.

Georgium Sidus, the name given by Herschel to the planet which he discovered March 13, 1781; now known as Uranus.

Georgswalde (gē-orgs-väl′dĕ), a town in Bohemia, Austria, on the Saxony frontier. It has linen manufacturers. Pop. (1910) 8836.

Geotropism (jē-ot′ru-pizm), in botany, a disposition or tendency to turn or incline towards the earth, as the characteristic commonly exhibited in a young plant, when deprived of the counteracting influence of light, of directing its growth towards the earth.

Geotrupidæ (jē-o-trū′pi-dē), a family of burrowing lamellicorn beetles. They inhabit temperate climates, and are useful in removing disgusting substances. When alarmed they feign death. The *Geotrupes ster-*

corarius, or watchman-beetle of Britain, is the type of the family.

Gepidæ (jĕp'i-dē) a people of Germanic origin, first read of as settled about the mouth of the Vistula in the third century. Before the fifth century they had migrated to the Lower Danube, where they were subjugated by the Huns; but, revolting against Attila's son, they recovered their freedom and established themselves in Dacia. There their power grew so great that they levied tribute from the Byzantine emperors down to Justinian's days. In the end of the fifth century a powerful enemy arose against them in the Ostrogoths; and after them came the Longobards, who, in alliance with the Avars, inflicted a crushing defeat on the Gepidæ in 566. A part submitted to the Avars, while a part accompanied the Longobards to Italy, and finally became assimilated.

Gera (gā'rā), the chief town of the principality of Reuss-Schleiz, in Germany, on the right bank of the Elster, 35 miles S. S. W. of Leipzig. It has manufactures of woolen, linen, cotton, and other goods. Pop. 47,455.

Gerace (je-rā'chā), a town of S. Italy, province of Reggio di Calabria, 36 miles N. E. of Reggio. The cathedral, once a handsome structure, was ruined by the earthquake of 1783. Pop. 10,752.

Gerando. See *De Gerando*.

Geraniaceæ (je-ra-ni-ā'se-ē), a nat. order of exogenous plants, the distinguishing character of which is to have a fruit composed of five capsules or cases, connected with as many flat styles, consolidated round a long, conical beak, giving some of the species the name of stork's-bill and crane's-bill. These plants are usually astringent and odoriferous, and many of them have beautiful flowers, especially those of the genus *Pelargonium*, natives of the Cape of Good Hope. The species are mostly herbaceous plants. A few of them have edible tubers. See next article.

Geranium (je-rā'ni-um), the typical genus of the order Geraniaceæ (which see), popular name crane's-bill. They have usually palmately divided leaves and regular flowers with ten stamens and five carpels. Some thirteen species are wild in Europe, of which the *G. robertianum* or herb-robert is the most common. An American species, *G. maculātum*, from its astringency called 'alum-root,' is used medicinally as a gargle and otherwise. The so-called geraniums of our gardens belong to the genus *Pelargonium*. Cultivation has produced many varieties, which from their beauty are great favorites.

Gérard (zhā-rär'), François Pascal, Baron, a French historical and portrait painter, born at Rome in 1770; went to Paris (1786), and studied under David. In 1795 he exhibited his first notable painting, *Belisarius*. He was much patronized by Napoleon, for whom he painted the battle of Austerlitz, and was made a baron by Louis XVIII, after completing his large painting of the *Entrance of Henry IV into Paris*. Amongst his portraits the most famous are those of Talleyrand, Talma, Louis Philippe, Madame Récamier, Mlle. Mars, etc. He died in 1837.

Gérard, Jean Ignace Isidore, a French caricaturist and book illustrator, generally known under the pseudonym of Grandville, was born at Nancy in 1803, died at Paris in 1847. He went to Paris in 1824, and after some minor works acquired great popularity in 1828 by his *Metamorphoses du Jour*, a representation under the guise of animal heads of human foibles and weaknesses. Later on he became a contributor to *Le Charivari* and an illustrator of the works of Béranger, La Fontaine, *Gulliver's Travels*, *Robinson Crusoe*, etc.

Gérard, Maurice Etienne, Count, marshal and peer of France, born 1773. He served as a soldier during the republic and the empire, distinguishing himself at Austerlitz and other battles. In 1813 he was made a general of division and a count. He distinguished himself in the battle of Ligny, and at Waterloo acted under Grouchy. He took an active part in the revolution of 1830; became war minister and marshal; commanded the troops which reduced Antwerp in 1832; became prime minister 1834; commander of the national guard 1838; died at Paris in 1852.

Gérard de Nerval, the pseudonym of Gérard Labrunie, a French man of letters, born in Paris in 1808. His earlier productions were poetic, *Elégies nationales* and *Poésies diverses*. As an adherent of the Romantic school he set himself to translate Goethe's *Faust*, and performed it in a manner which the old poet himself pronounced a marvel of style. Amongst his best works are his short tales and sketches, *Voyages en Orient*, *Contes et Facéties*, *La Bohème Galante*, etc. He became insane and committed suicide in Paris, 1855.

Gerasa (je-rā'sà), Gerash, or Djerash, a ruined town in Syria, 80 miles S. S. W. of the town of Damascus. It was several times de-

stroyed and rebuilt. The ruins, comprising ancient walls, gateways, a forum, baths, theaters, and temples, are very extensive.

Gerba, or JERBA (jėr'ba), an island in the Gulf of Cabes, off the coast of Tunis. It is about 20 miles long and 14 broad. The surface is level and fertile, and occupied by a population of 45,000, mostly Berbers.

Gerbillus (jer-bil'us), a genus of small burrowing rodents (the gerbils) of the family Muridæ (mice). They have a long tail, which is tufted at the end. There are several species, found in the sandy parts of Africa and Asia. The Egyptian gerbil (*G. Ægyptiacus*), which inhabits Egypt around the pyramids, is the type. It is about the size of a mouse and of a clear yellow color.

Gerfalcon (jer'faw-kn). See *Falcon.*

Gerhard (ger'hart), EDUARD, a German archæologist, born in 1795; died in 1867. Having traveled in Italy, he devoted himself to archæology, and in 1829 took part in founding the Archæological Institute at Rome. Returning to Germany in 1837, he became archæologist at the Royal Museum at Berlin, and afterwards professor at the university. Among his numerous works are the following: *Antike Bildwerke* (with 140 plates); *Auserlesene Griechische Vasenbilder* (330 plates); *Etruskische und Campanische Vasenbilder, Griechische Mythologie,* etc.

Gerhardt, KARL, an American sculptor, born at Boston in 1853. His works of sculpture include busts of General Grant, Henry Ward Beecher and Samuel L. Clemens and statues of John Fitch, Nathan Hale, Israel Putnam and many others.

Gerhardt (ger'hart), KARL FRIEDRICH, a German chemist, born in 1816. He studied under Liebig at Giessen, went to Paris in 1838, was appointed professor of chemistry at Montpellier, returned to Paris in 1842 to pursue his investigations; went in 1855 to Strasburg as professor in chemistry and pharmacy, but died soon after, in 1856. Gerhardt is the author of several works, amongst which the most celebrated is his valuable *Traité de Chimie Organique.* The methods he originated have had a great influence on modern chemistry.

Gerhardt, PAUL, the greatest of German hymn-writers, born in 1607. He studied theology, became pastor of Mittenwalde in 1651, and afterwards at Berlin. A strict Lutheran, he opposed energetically all attempts to unite the Lutheran and Reformed Churches, and was removed from his church in 1666 in consequence of his refusal to subscribe to the edict of 16th Sept., 1664, prohibiting mutual insults or offensive language between the churches. In 1668 he was made archdeacon in Lübben, where he died in 1676. His excellent book of hymns appeared at Berlin in 1667 (*Geistliche Andachten*). Many particular hymns have found English translators and appreciation.

Géricault (zhā-rē-kō), JEAN LOUIS THÉODORE ANDRÉ, a French painter, born at Rouen in 1791; went to Paris in 1806 and studied under Charles Vernet and Guérin. His first pictures (the *Chasseur Officer* and the *Wounded Cuirassier*) were exhibited in 1812 and 1814. In 1817 he visited Italy, returned to Paris in 1819, and painted the *Raft of the Medusa* (a well-known shipwreck of the time), a work of much power, which won immediate popularity. He died at Paris in 1824.

Gerizim (jėr-i'zim), MOUNT. See *Ebal.*

Germ (jėrm), in physiology, the earliest form under which any organism appears; that is, the rudimentary or embryonic form of an organism. The name is also given to certain minute organisms which give rise to disease. See *Germ Theory.*

Germain (zher-maṇ), ST., the name of a number of places in France, among which is St. Germain-en-Laye, a town in the department of Seine-et-Oise, about 6 miles north from Versailles and 11 miles W. N. W. from Paris, on the left bank of the Seine. The most remarkable building is the royal palace, commenced by Charles V in 1370, and embellished by several of his successors, especially Francis I and Louis XIV. It was used as a prison during the revolution, afterwards as a high school for calvary officers, and was ultimately restored in 1862 by Napoleon III, who established in it a museum of Gallo-Roman antiquities. The forest of St. Germain is one of the finest in France, extending over 10,000 acres. Pop. 17,297.

German Catholics, a religious sect which sprung up in Germany about the close of the year 1844. The immediate cause of its formation was the exhibition by Arnoldi, bishop of Trèves, of the holy coat preserved in the cathedral of that city, accompanied by a promise of plenary indulgence to whoever should make a pilgrimage to Trèves to worship it. The announcement caused a general feeling of astonishment in Germany, and two

priests, Johannes Ronge of Silesia and Johann Czerski of Posen, whose independent views had already caused the deposition of the one and the secession of the other, led a secession movement, appealing to the lower grades of clergy to unite in founding a national German church independent of the pope. A number of congregations were formed, especially in Leipzig, under the celebrated Robert Blum, and in Magdeburg, under the teacher Kote. Two creeds were drawn up for the new church, the *Confession of Schneidemühl*, by Czerski, which, though somewhat Roman Catholic, rejected indulgences, purgatory, auricular confession, etc., and the *Confession of Breslau*, drawn up by Ronge. The latter, which was far more heterodox, was substantially adopted by the Council which met at Leipzig, March 22, 1845. The organization was almost the same as that of the Presbyterian Dissenting churches of Scotland. Each congregation was to choose its own pastor and elders. For a time the new church had a great success. Many Protestants joined the body, which, by the end of 1845, numbered nearly 300 congregations. Difficulties soon arose, however. The majority of the German governments began to use repressive measures. More fatal were internal dissensions, one party, headed by Czerski, clinging to the traditions and doctrines of the Roman Catholic Church, the other, headed by Ronge, tending to mix up democratic and socialistic principles with their creed. After the rise of 'Old Catholicism' the movement lost all importance.

German Confederation. See *Germany*.

German Evangelical Protestant Church (United States) is liberal in doctrinal belief, having no confession of faith. Its ministers are associated in district unions. It has a membership of about 35,000.

German Evangelical Synod of North America. This body accepts the symbolical books of the Lutheran and Reformed Churches, representing in the United States the State Church of Prussia, which is a union of the Lutheran and Reformed bodies. It celebrated, Oct. 12, 1890, the semicentennial anniversary of its organization in the United States. The number of members is about 300,000.

Germanicus (jer-man'i-kus), Cæsar, a distinguished Roman, son of Nero Claudius Drusus and the younger Antonia, a niece of Augustus, was born B.C. 15. He was adopted by Tiberius, his parental uncle, and married Agrippina, the granddaughter of Augustus. When Augustus died (in A.D. 14) Germanicus was invited by the rebellious legions on the Rhine to assume the sovereignty, but refused, and quelled the revolt. He then crossed the Rhine, surprised and defeated the Marsi with great slaughter. Next year (A.D. 15), a campaign against the Catti and the Germans, led by Arminius, resulted in a series of victories. The following year he again made his way into Germany, defeated the Cherusci twice, and made an incursion into the country of the Marsi. Tiberius now became jealous of the glory of Germanicus, called him home under pretense of granting him a triumph, then, to get rid of him, sent him into the East to compose the disturbances in Armenia and Cappadocia. This he performed in A.D. 18, visited Egypt the following year and died on his return to Syria (A.D. 19) under some suspicion of having been poisoned by Cn. Piso, the governor of Syria.

Germanium (jer-man'i-um), a metallic element discovered by Dr. Winckler in 1885. Its symbol is Ge; atomic weight 72.3; has a melting point of about 1650° F., a perfect metallic luster and a grayish-white color. Fifteen years before its discovery its existence had been prophesied by Mendelejeff to fill a gap in his periodic table between silicon and tin.

German Ocean. See *North Sea*.

German Paste, the name given to a kind of paste made for feeding cage-birds, such as canaries, larks, nightingales, etc. The following is one of various recipes: one pound of pea-meal, half a pound of blanched sweet almonds, two ounces of fresh butter, two ounces of moist sugar, fifteen grains of hay saffron. Mix and beat well with a little water, pass through a colander, then expose to the air till dry.

German Sarsaparilla, a name given to the roots or rhizomes of *Carex arenaria*, *C. disticha*, and *C. hirta*, from their being occasionally used in Germany as a substitute for sarsaparilla.

German Silver, Nickel Silver, or Packfong, is an alloy of copper, nickel, and zinc in different proportions, amongst which the following may be mentioned. Spoons and forks are made from 2 parts copper, 1 nickel, 1 zinc; knife and fork handles from 5 copper, 2

nickel, 2 zinc, a mixture closely resembling alloyed silver; addition of lead produces an alloy which appears well fitted for casts, and for making candlesticks, etc.; iron or steel, on the other hand, makes the alloy whiter, harder, and more brittle. German silver is harder than true silver, and takes a splendid, high polish. It melts at a red heat, the zinc being volatilized in the open air. It is attacked by the strong acids, and it is also affected by common organic acids, such as vinegar, and by some saline solutions.

German Tinder, or AMADOU, is prepared from the *Bolētus fomentarius*, a fungus growing on the oak, birch, and some other trees, or from the *Bolētus igniarius* found on the willow, cherry, plum, and other trees. The fungus is removed with a sharp knife, washed, boiled in a strong solution of saltpeter, beaten with a mallet, and dried. In surgery it is sometimes used to stop local bleeding.

Germantown (jer'man-toun), a northern section of Philadelphia, pleasantly situated on high ground, about 6 miles north of the city hall. It was settled by Germans about 1683 immediately after the founding of Philadelphia, and here Washington attacked the British occupying Philadelphia, October 4, 1777, but was defeated. It is largely settled by business men of the city and contains many elegant residences.

Germany (jer'ma-ni; Latin, *Germania;* German, *Deutschland;* French, *Allemagne*), the name given collectively to the states in Central Europe which constitute the German Empire. The limits of Germany have varied greatly at different times; and at present there are large numbers of Germans in race and language who are not included within the boundaries of the empire, many being natives of Austria and Switzerland. As one of the Teutonic peoples, the Germans are akin by race to the Dutch, English and Scandinavian peoples. The capital of Germany is Berlin; Weimar was the temporary capital on the overthrow of the monarchy, 1918; other large cities are Hamburg, Breslau, Munich, Dresden, Leipzig, Cologne. The following table shows the component parts of the German Empire as it existed prior to the European war of 1914-18. By the peace of Versailles, 1919 (see *Treaty*), Germany lost Alsace-Lorraine (to France) and parts of Prussia (to Poland), and all her colonies. With the abdication of William II, in 1918, Germany became a republic. Pop. 59,000,000.

KINGDOMS.	Area in sq. miles.	Population.
1. Prussia	134,463	37,293,324
2. Bavaria	29,282	6,524,273
3. Würtemberg	7,528	2,302,179
4. Saxony	5,787	4,508,601
IMPERIAL TERRITORY.		
5. Alsace-Lorraine	5,668	1,814,564
GRAND-DUCHIES.		
6. Baden	5,821	2,010,728
7. Hesse	2,965	1,209,175
8. Mecklenburg-Schwerin	5,135	625,145
9. Mecklenburg-Strelitz	1,131	103,451
10. Oldenburg	2,479	438,856
11. Saxe-Weimar	1,388	388,095
DUCHIES.		
12. Brunswick	1,424	485,958
13. Saxe-Meiningen	953	268,916
14. Saxe-Coburg and Gotha	755	242,432
15. Saxe-Altenburg	511	206,508
16. Anhalt	906	328,029
PRINCIPALITIES.		
17. Waldeck	433	59,127
18. Lippe	469	143,577
19. Schaumburg-Lippe	131	44,992
20. Schwarsburg-Rudolstadt	363	96,825
21. Schwarsburg-Sondershausen	333	85,152
22. Reuss (elder line)	122	70,603
23. Reuss (younger line)	319	144,584
FORMER FREE TOWNS.		
24. Bremen	99	263,440
25. Hamburg	158	874,878
26. Lübeck	115	105,857
	208,738	60,641,278

Physical Features.—Germany, as regards its surface, may be divided into three different regions. Farthest south is the Alpine region along the southern frontier, comprising parts of Bavaria, Würtemberg, and Baden lying next to Austria and Switzerland. North of this the Suabian-Bavarian plateau extends to the mountain region of Central Germany, where the chain known as the Fichtelgebirge is continued east by the Erzgebirge and the Riesengebirge, forming the boundary next Austria; west by the Thüringerwald, Rhöngebirge, and Spessart; farther north lie the Harz Mountains. The great plain in the north extends without interruption to the German Ocean and the Baltic. Germany is remarkably well watered. Its central mountain region and plateau form part of the great watershed of Europe. The Danube proceeds across it in an eastern direction, and the Rhine, though it neither rises nor terminates within Ger-

many, flows within it for the greater part of its course. After these come the Elbe, the Oder, Weser, Main, Neckar, Mosel, Ems, and Eider—all of which are navigable. Germany possesses much and varied mineral riches, the most important minerals being bituminous and brown coal, iron, zinc, lead, and salt. Tin, quicksilver, antimony, sulphur, marble, kaolin, asbestos, freestone, etc., occur in various localities. Germany is likewise extremely rich in mineral waters, especially in the southern parts. Though the country extends over 8½° of latitude, its mean annual temperature is remarkably uniform. This is owing mainly to the different elevations of the surface, the low plains of the north having a higher, while the hills and plateaux of the south have a lower temperature than their latitudes might seem to indicate. The mildest climate is enjoyed by the valleys of the Rhine and the Main.

Agricultural Products, Etc.—These are varied and numerous. With the exception of the loftier mountain districts, where the surface is fit only for pasture, the growth of all the ordinary cereals is universal. Potatoes, hemp, and flax also form most important crops, and in many parts the sugar-beet is cultivated on an extensive scale; also tobacco and hops. Wine is produced in many districts. The cultivation of the vine diminishes in importance from southwest to northeast, but is carried on to some extent even in the Prussian provinces of Saxony, Brandenburg, and Posen. Great quantities of other fruits are produced, principally the apple, pear, plum, and cherry. The forests are of great extent and value, particularly in the mountain districts. The central plateau is more sparingly wooded, but the eastern part of the north plain has extensive forests. This plain is largely sandy, but has been made to yield abundantly and furnishes grazing grounds for large numbers of farm animals. Among domestic animals, the horned cattle of the districts along the North Sea and the Baltic, the sheep of Saxony and Silesia, and the swine of Westphalia have long been famous. The horse, except in Schleswig-Holstein, East Prussia, Mecklenburg, and some other parts, appears to be much neglected. Game is very abundant, and includes, in addition to the smaller kinds, the boar and the wolf. Fish are numerous, both in the rivers and lakes.

Manufactures.—Linens are made in every part of Germany, but more especially in Westphalia, Silesia, Bohemia, and Saxony; woolens in the Prussian provinces of the Rhine, Saxony, Brandenburg, and Silesia, in the kingdom of Saxony, and in Alsace; the cotton manufacture constitutes the chief manufacturing industry in Alsace-Lorraine, the kingdoms of Saxony and Würtemberg, and the grand-duchy of Baden, and flourishes in Bavaria, Prussia, and other parts; the silk manufacture flourishes in the Rhine provinces and in Baden; iron manufactures are carried on in most of the states, but principally in Prussia, Alsace-Lorraine, Bavaria, and Saxony; steel is largely manufactured in the Rhine provinces. The manufactures of beet-root sugar, of leather, of metals, porcelain, glass, fancy flowers, hats, musical instruments, watches, clocks, wooden wares, including toys, etc., are likewise important; and breweries and distilleries are to be met with everywhere, beer being the favorite beverage of the Germans. Stettin is one of the principal shipbuilding centers in the world and the Krupp ironworks at Essen are unrivaled.

Commerce.—The commerce is very extensive, and is administered and guided by special laws of a union called the Zollverein or Customs Union, which embraces the whole of Germany and also the grand-duchy of Luxemburg. The exports and imports comprise a great variety of manufactured goods and raw products. The manufactures of Germany are now sent to all parts of the world, and in various places there is a strong competition between German and British goods. By far the principal seaport is Hamburg; others are Bremen and Bremerhaven, Stettin, Königsberg, Dantzig, Lübeck, etc. The total length of railways is over 37,000 English miles, of which all but about one-twelfth are state railways. By the law of Dec. 4, 1871, a uniform gold standard was introduced for the monetary system of the whole German Empire. The denominational unit is the *mark*, nearly equal to 1*s.* of British money and divided into a hundred *pfennige*. Since 1872 the French metrical system of weights and measures has been in force throughout the German Empire. See *Decimal System*.

Finances.—The revenue is derived principally from the customs duties collected throughout the Zollverein, from excise duties on beet-root sugar, salt, tobacco, and malt, and from the contributions made by each state in proportion to its population. According to the budget for year ending March 31, 1911, the revenue amounted to 2,853,781,095 marks, of which customs and excise were estimated to yield 1,441,620,000 marks. The chief item in the expenditure was on military administration, amounting to 806,740,757

marks. The estimate for the navy was 442,178,342 marks. A mark is equivalent to 23.8 cents. The debt of the empire is of no great amount.

Constitution.—The constitution of the German Empire is based upon the decree of the 16th of April, 1871, which took effect on the 4th of May following. The presidency of the empire belongs to the crown of Prussia, to which is attached the hereditary title of *Emperor of Germany*. The prerogatives of the emperor are to represent the empire in its relation to other states, to declare war if defensive, and conclude peace in name of the empire, to contract alliances, etc. The emperor has also the supreme command of the army and the navy, appoints and dismisses officials of the empire, appoints consuls, and superintends the entire consulate of the empire. The legislative authority is vested in the Bundesrath (Federal Council) and the Reichstag (Imperial Diet), the former consisting of 58 representatives of the different states of the empire, 17 from Prussia, 6 from Bavaria, 4 each from Saxony and Würtemberg, 3 each from Baden and Hesse, 1 from Saxe-Weimar, etc. The Reichstag consists of 397 deputies elected by secret voting in all the states of the empire.

Army and Navy.—Service in the army or navy is obligatory on every man in Germany from the 1st of January of the year in which he completes the twentieth year of his age to the end of his forty-second year, unless he be released altogether, or for times of peace, by the competent authorities. Seven years must be spent in the standing army or fleet (three of them in active service in the cavalry and two in the infantry, and the remainder in the reserve). The next five years are passed in the Landwehr, the members of which may be called out only twice for training during that period. All men capable of bearing arms who are not in the line, the reserve, or the Landwehr, must belong to the Landsturm, which is called out only in case of invasion of the territory of the empire. Young men above seventeen years of age who are able to pass an examination upon general subjects, and who volunteer for active service in the army, and agree to equip and maintain themselves during the time that their active service lasts, are admitted into the reserve after one year's continuous service. The peace strength of the army, in 1915, was 870,000 men, and the total war strength of trained soldiers 5,400,000. The German navy consisted, in 1915, of 100 battleships and armored cruisers, 308 torpedo boats and destroyers, and was being rapidly added to, especially with battleships of great size and power.

Religion and Education.—While the Roman Catholic Church is strong in Germany, having a membership of more than 20,000,000, the Protestant denominations are greatly in the lead, having nearly double this membership. There are also over a half million of Jews. Education is compulsory throughout Germany. Every commune or parish must support at its own cost a primary school. Every town in addition must maintain one or more middle schools, which supply a higher education than the elementary schools. Above these are *real schools* (*Realschulen*) giving a still higher education, institutions of similar standing called *gymnasiums*, giving an education in which the ancient languages form a more important element, and, above all, the universities, of which there are 21 in the country, the chief being those of Berlin, Leipzig, and Munich. The Germans as a whole are perhaps the best educated people in the world.

History.—The date of the first arrival of the Germanic or Teutonic races in Europe is unknown. At the close of the second century B. C. Germanic tribes called Cimbri and Teutones left their homes in the Danish peninsula, and descending upon Italy, were defeated by Marius at Aquæ Sextiæ (Aix in Provence) and Vercellæ in Northern Italy. The Romans did not again come in contact with the Germans till Cæsar's invasion of Gaul brought on a contest with the Suevian prince Ariovistus (58 B.C.). At that time several German tribes had crossed the Rhine and settled in the district between that river and the Vosges Mountains, while others had pushed their way through what is now Belgium. The Germans on the left bank of the Rhine were soon subjugated, and two expeditions were made by Cæsar across the Rhine. Under Augustus a systematic attempt was made to subjugate the vast and little-known region of Germania, extending between the Rhine and the Vistula, and from the Danube to the North Sea. Tiberius reduced all the tribes between the Rhine and the Elbe, but a few years later there was a revolt, in which three Roman legions under Varus were annihilated by Arminius, leader of the Cherusci, about 9 A.D. The attempt to subjugate the Germans was given up by Augustus; and Germanicus, although he avenged the defeat of Varus by a succession of campaigns, failed to recover the Roman ascendency. About this time each tribe or nation among the Germans is described as having been di-

vided into four classes: 1. The nobles, from whom the kings and chiefs of the districts were chosen. 2. The freemen, who, with the nobles, had the right to choose their residence and hold heritable property, and who formed the chief strength of the armies and voted in the popular assemblies. 3. The freedmen, a middle class between freemen and slaves, who had no landed property, but farmed the land; they were not admitted to the popular assemblies. 4. The slaves, who were entirely in the power of their masters. In religion the Germans were polytheists. Among their great gods were Woden (or Odin), Donar (Thor), Thiu (Tyr), Frigga, etc. They erected no temples and had no idols, but believed in a future life and in eternal justice.

As the aggressive force of the Roman empire abated, it continued to be more and more subject to the incursions of the Germans, who by the end of the fifth century had overrun Gaul, Italy, Spain, and part of Africa. After this Germany itself continued in a divided state till it came under the single rule of Charlemagne. (See *France*.) The history of the German Empire proper commences with the Treaty of Verdun (843 A.D.), which separated the land of the Eastern Franks under Ludwig the German from that of the Western and Central Franks. Out of Ludwig's kingdom was developed the German nationality. Charles the Fat became emperor in 881, and three years later was also elected king of the West Franks, thus again uniting under one scepter the monarchy of Charlemagne. After his deposition in 887 the two territories of the Eastern and Western Franks were again separated, the former electing Arnulf as their king. He died in 899, and was succeeded by his infant son Louis, who was proclaimed King of Lorraine in 900, assumed the title of emperor in 908, and as such is designated Louis IV. He died in 911, and the German nations chose Conrad, Count or Duke of Franconia, as his successor. He died in December, 918, of a wound received in battle with the Huns. In 919 Henry the Fowler, Duke of Saxony, was elected. He was succeeded by his son, Otto the Great in 936, who revived the empire of Charlemagne, receiving the crown of Holy Roman Empire from the pope in 962. He died in 973, and was succeeded by his son, Otto II, who had been crowned emperor by the pope in his father's lifetime. Henry II, Duke of Bavaria, surnamed the Saint, the hereditary heir of the Saxon line, was elected at Mainz, on the death of Otto in 1002, crowned emperor in Rome 1014, and died in 1024. With him ends the Saxon line of emperors.

Conrad II, surnamed the Salic, a Franconian nobleman, was chosen to succeed him. He spent several years in Italian wars, defeated the Poles, and restored Lusatia to the empire. He died in 1039. He was succeeded by his son, Henry III, who had been chosen in his lifetime, and who, the imperial power being now at its highest point, exercised more despotic authority in Germany than any of his predecessors. The fruits of his policy were lost by his son, Henry IV (1056-1106). In his reign occurred the famous quarrel with the pope regarding investitures, which ended in Henry having to humble himself before the pope at Canossa. His life was embittered by contests against rival emperors and later by the defection to the papal party of his own son Henry, by whom he was eventually deposed. Henry V (1106-25) inherited, however, the quarrel of the investitures, took Pope Paschal II prisoner, and was excommunicated by seven councils. At length the question of investiture was settled by the Concordat of Worms (1122). On his death there was a contested election and a civil war between Lothaire, Duke of Saxony, and Conrad of Hohenstaufen, in which the former was successful.

A contest was now begun between the Saxon and Hohenstaufen (Suabian) families, in which the celebrated party names Guelf and Ghibelline originated. On the death of Lothaire in 1138 Conrad III (of Hohenstaufen) was chosen to succeed him. Conrad died in 1152, and was succeeded by his nephew Frederick Barbarossa (which see). His son, Henry VI, began his reign with a war in Southern Italy. He conquered Sicily, and was crowned king of it in 1194. He died at Messina in 1197. Philip, brother of Henry, and Otto IV, were elected by rival factions in 1198. Philip, who was successful, was assassinated in 1208. Otto IV, the son of Henry the Lion, was recognized by the Diet of Frankfort in 1208 as the successor of Philip. He attempted the conquest of the Two Sicilies without success, and died in 1218. Frederick II, King of the Sicilies, was elected emperor in 1212. His life passed in contentions with the popes and the Lombard cities. He died in 1250. Conrad IV, his son, had to contend against William of Holland. He died in 1254. He was the last emperor of the house of Hohenstaufen, which became extinct on the death of his son. His successor, William of Holland, was slain in Friesland in 1256. Richard, Earl of Cornwall, and

Alfonso X, King of Castile, were chosen emperors in 1257; but the internal divisions of Germany had already deprived the office of all authority, and neither of them had any power. Until 1278 the German Empire had no real head.

Rudolph, Count of Hapsburg and Cyburg, the most powerful prince in Helvetia, was chosen emperor in 1272, and under him and his successors the status of the empire was restored. He enriched his own family by his victories over the King of Bohemia, and acquired Austria, Styria, and Carinthia as imperial fiefs for his sons Albert and Rudolph. He died in 1291. Adolphus of Nassau, his successor, was deposed in 1298 by the Diet of Mainz. Albert I, son of Rudolph, was chosen emperor the same year. He is chiefly celebrated for his wars with the Swiss as Duke of Austria, which led to the independence of Switzerland. He died in 1308, and was succeeded by Henry VII of Luxembourg, who, during nearly the whole of his reign, lived in Italy, where he died in 1313. In 1314 a double election took place, Frederick, Duke of Austria, sometimes called Frederick III, was elected along with Louis of Bavaria. On the death of Frederick in 1330 the latter became sole emperor. He died excommunicated and deposed in 1347. Charles IV, King of Bohemia, was elected in 1346. His reign is chiefly distinguished for the Golden Bull (1356) regulating the electorate. (See *Golden Bull.*) He died in 1378. Wenceslaus, his son, was deposed for his excesses in 1400. Rupert, Count Palatine, elected in 1400, possessed little authority. Sigismund, King of Hungary and Bohemia, son of Charles IV, was elected by a party in 1410. His reign is distinguished by the commencement of the Reformation in Bohemia, by the Council of Constance, and the condemnation of Huss and Jerome. He died in 1437. Albert II (V of Austria) was elected in 1438, and died in 1439. He was succeeded by Frederick III, Duke of Styria and Carinthia. He was the last emperor who was crowned in Rome. Thenceforth the German emperors were always of the house of Austria. He died in 1493. His son, Maximilian I, succeeded. During his reign the Diet of Cologne was held, which divided the estates of the empire into ten circles for the better maintenance of the public peace.

During the period here briefly reviewed the empire had undergone many changes. At the extinction of the Carlovingian dynasty Germany was divided into five nations or dukedoms—Franconia, Suabia, Bavaria, Saxony, and Lorraine. Henry the Fowler and the Ottos added the marches of Austria and Misnia; Henry the Lion and Albert of Brandenburg added Mecklenburg and Pomerania. The house of Austria added Styria, Carinthia, Carniola, and the Tyrol. But Switzerland had been lost, and the old Burgundian territories of the empire, Franche Comté, the Lyonnais, and Provence, had gone to consolidate the French monarchy under Louis XI. Bohemia and Hungary, and many of the Italian cities, especially in the north, were also connected with the empire, but the connection was more formal than real, and the circles established by the Diet of Cologne (1512) represented at that time the estates of the empire, viz.: 1. Austria, 2. Bavaria, 3. Suabia, 4. Franconia, 5. the Upper Rhine (Lorraine, Hesse, etc.), 6. the Lower Rhine, or the Electorates (Mainz, Trier, Cologne), 7. Burgundy (Netherlands), 8. Westphalia, 9. Lower Saxony (Brunswick, Lüneburg, Lauenburg, Holstein, etc.), 10. Upper Saxony (Saxony, Brandenburg, Pomerania, etc.).

The chief political machinery of the empire was connected with the diet, or administrative assembly. The exact constitution of the early German diets is not known. In the 12th century the counts of the empire became distinguished from the princes, and lost the right of voting in the diets. The election of an emperor was at first undertaken by the whole diet. In the 13th century the number of electors was restricted to seven, to which two more were afterwards added. (See *Elector.*) The diets were called by the emperor at his own pleasure, but as they had the power of granting supplies their meetings were frequent; and as their authority over the different states was partial, and their policy could only be carried out by the executive force of the emperor, they can hardly be regarded as an independent power in the state. Neither the time nor the place of meeting of the diets was at first fixed. From an early period the cities of Germany were represented in the diet. In early times they generally supported the authority of the emperor, as their interest was common with his in diminishing the power of the greater vassals. Municipalities were at first established about the reign of Frederick I, and soon began to assert their independence. The predatory habits of the nobles, besides the claims of superiority over entire cities or particular citizens asserted by the princes, involved the cities in continual warfare with the feudal nobility, and often also with their ecclesiastical superiors. The

necessity of defending their privileges compelled them to enter into leagues among themselves. Among the earliest of these combinations was the Hanseatic League, formed to resist both the oppression of rulers and the depredations of land and sea robbers. A league was formed in 1255 by more than sixty cities of the Rhine, headed by the three ecclesiastical electors, to resist the depredations of the lesser nobles. The Suabian League, formed in 1376, was of similar origin. These leagues were met by counter-associations of nobles and princes.

Maximilian, who succeeded to the empire in 1493, was succeeded in 1519 by his grandson Charles V. (See *Maximilian I, Charles V.*) The reign of Charles, the most important in the German annals and the most brilliant in the 16th century, was divided among three great conflicts—the continued struggle between France and Germany, the conflict with the encroaching Ottoman empire, and that with the Reformation. In 1556 Charles resigned the empire to his brother Ferdinand. The Council of Trent was concluded in Ferdinand's reign. He died in 1564. Then followed Maxmilian II, Rudolph II, Matthias and Ferdinand II. By this time was begun a religious war, by which Germany was devastated for thirty years, hence called the Thirty Years' war.

The invasion of Germany by Christian IV of Denmark in 1625, the Peace of Lübeck (1629), the invasion of Gustavus Adolphus (1630), the battles of Leipzig in 1631, of the Lech and Lützen in 1632, of Nördlingen in 1634, the war with France in 1635, belong to the history of the Thirty Years' war (which see). Ferdinand died in 1637, and was succeeded by his son, Ferdinand II. The latter had gained a military reputation by the battle of Nördlingen, but Banér, Bernhard of Saxe-Weimar, Torstenson, Turenne, and the Great Condé gained repeated victories over his troops. He was at length induced to enter into negotiations; and the Thirty Years' war was concluded by the Peace of Westphalia (24th October, 1648), in which the policy of France and Sweden was triumphant. The principal conditions which concerned Germany were a general amnesty and restoration of rights. France received definitely the bishoprics of Metz, Toul, and Verdun, with Breisach, Upper and Lower Alsace, and ten imperial cities in Alsace. Sweden received Rügen, and Hither Pomerania and part of Farther Pomerania, with some other territories. Greater power was given to the Protestants and the right of the princes and states to make war and alliances among themselves or with foreigners was recognised.

The emperor died in 1657. His son, Leopold I, was elected emperor in 1658. The success of Louis XIV in his invasion of Holland led to a coalition against him, in which the emperor joined (1673). The war was continued for some years, and terminated by the Peace of Nimeguen, 1679. The League of Augsburg, in which the emperor joined, led to a second protracted war with France, which was concluded by the Peace of Ryswick. In 1692 the emperor erected Hanover into an electorate, and in 1700 he permitted the Elector of Brandenburg, Frederick III, to take the title of King of Prussia. The war of the Spanish Succession, in which Great Britain, Holland, and the empire were leagued against France, was begun in 1702. To it belong the victories of Marlborough and Eugene (Blenheim, Oudenarde, Malplaquet). The Emperor Leopold died in 1705. He was succeeded by his son, Joseph I, who died in 1711. Joseph was succeeded by his brother, Charles VI. (See *Charles VI.*) The alliance against France was dissolved by the Peace of Utrecht in 1713, to which the emperor refused to accede, and was left alone against France. After a brief campaign between Prince Eugene and Villars he acceded to the Treaty of Rastadt, negotiated between these commanders, 7th March, 1714. The Spanish Netherlands, and Naples, Milan, Sardinia, and other Italian conquests were left to the emperor. Having no male heirs, Charles had promulgated in 1713 the Pragmatic Sanction, regulating the succession to his hereditary dominions in favor of his daughters in preference to those of his brother, Joseph I. He died in 1740. Charles Albert, elector of Bavaria, son-in-law of Leopold I, got himself chosen emperor (as Charles VII) in 1742. He laid claim to the hereditary possessions of the House of Austria, and entered into an alliance with France, Spain, Prussia, etc., against Maria Theresa, daughter of Charles VI. But he died in 1745, and Francis I, Grand-duke of Tuscany, the husband of Maria Theresa, was elected emperor; thus the House of Hapsburg-Lorraine, which had succeeded to the hereditary possessions of Austria, was recognized as the head of the empire. After a brief interval there took place the Seven Years' war (1756-63), in which Austria, Russia, France, and Saxony combined against Prussia, then ruled by Frederick the Great. The Peace of Hubertsburg (15th Feb., 1763) concluded the war, Prussia retaining her acquisitions. In 1765 Joseph II succeeded to

the imperial crown, becoming at the same time co-regent with his mother of the Austrian hereditary dominions. He joined with Russia and Prussia in the first partition of Poland (1772). He was succeeded by his brother Leopold, who, dying in 1792, was succeeded by his son, Francis II. He joined in 1793 in the second partition of Poland. He took the command of his army against the French in 1794, concluded the Peace of Campo Formio with Bonaparte (17th October, 1797) joined the second coalition against France in 1799, and concluded the Treaty of Lunéville (3d February, 1801); joined the third coalition in 1805, and concluded the Treaty of Presburg (26th December, 1805). In 1804 Francis took the title of hereditary Emperor of Austria, renouncing two years later that of head of the German Empire, which, indeed, had ceased to exist, owing to the conquests of Napoleon.

The States of Germany were again united by the Treaty of Vienna (1815), in a confederation called the German Confederation (der Deutsche Bund). In 1818 a general commercial league, called the Zollverein, was projected by Prussia, and was gradually joined by most of the German states, exclusive of Austria. Revolutionary outbreaks caused great disturbances in various German states in 1830 and 1848, particularly the latter. The German diet was restored in 1851 by the efforts of Prussia and Austria, who became rivals for the supremacy in the confederation. In 1866 the majority of the diet supported Austria in her dispute with Prussia respecting the disposal of the duchies of Schleswig and Holstein, whereupon Prussia withdrew from the confederation and declared it dissolved. The Seven Weeks' war between Austria and Prussia ended in the defeat of the former, the loss of her Italian possessions, and her exclusion from the German Confederation, which was re-formed by Prussia under the title of the North German Confederation. After the Franco-German war (which see), in which the South German States, as well as the North German Confederation, supported Prussia, King William of Prussia was proclaimed German Emperor at Versailles on 18th January, 1871, the new empire comprising all the German States with the exception of Austria. The parliament of the new German Empire met at Berlin on 21st March, and adopted the new constitution. William I died in 1888 and was succeeded by his son Frederick, who, however, died in the same year from a cancerous affection in his throat, and was succeeded by his son as William II. Since the unity of the empire was attained endeavors have been made to establish a colonial empire, principally in Africa, including German East and Southwest Africa and a large tract of land in the region of the French Congo, adjoining the German Kamerun protectorate.

In Polynesia, Germany acquired a portion of New Guinea, the Bismarck Archipelago, and some of the Solomon and Marshall Islands. It had also taken possession of a seaport region of northern China, with the surrounding inland section. In 1914 it took up the quarrel between Austria and Servia, fomenting a war in which the leading nations of Europe became engaged, and subsequently those of Asia and America. As regards the colonial possessions of Germany, above mentioned, it will suffice to say here that they were all lost in consequence of the war. For the conflict that followed the Servian trouble, the greatest, in several respects, in the history of the world, Germany was amply prepared, having been transformed into a military machine, without equal elsewhere on the earth. For a century it had been developing its system of militarism, and, by 1914, the nation had become a trained army of unequaled efficiency, while its military equipment was, in many respects, complete. Austria, its chief auxiliary in the war, was also in good fighting order, but the same was the case with its neighboring enemies, France and Russia, which had followed the example of Germany in developing a system of militarism. This was not the case with Britain, which had no system of conscription or general training. But, on the other hand, it had the decided advantage of possessing much the greatest naval force in the world, this giving it control of the sea so far as surface navigation was concerned. Such was the position of Germany and its chief enemies when the great European War began in August, 1914. The kaiser, William II, had complete military control of the national Teutonic fighting machine and had long cherished an ambition to lift Germany to the position of autocrat over the nations of the world. At all events, such was apparently the case, it being a very widespread opinion that Kaiser William had made the murder of the Austrian Archduke the pretext for plunging all Europe into war for purposes of his own. In the diplomatic correspondence that followed, the voice of Austria is scarcely heard, the dealings of Russia, France and Britain being with Germany alone.

Germany took the opening part in the

war that was thus forced upon Europe, the vanguard of its army being across the border of Belgium before the exchange of diplomatic notes had ended and war been openly declared. This hasty action was taken advisedly, the purpose being to invade France by a flank attack through Belgium before it could get its army effectively into the field. Belgium, small as it was, defeated this scheme, holding back the invaders while the work of mobilization in France went actively on. When the German invaders at length crossed the French frontier, a powerful and well-equipped army was ready to meet them. At first, indeed, it seemed as if the disaster of 1870 was to be repeated, the French forces, with their small British contingent, falling back before the vigorous German advance until the banks of the Marne were reached and the outer defenses of Paris brought almost within cannon range. Then, with a powerful reverse movement, the armies of France were hurled upon their foes and the German forces driven irresistibly back until their line of defense on the Aisne was reached. Here a trench line had been prepared and at this point began the system of trench warfare which was to be continued in that quarter for years. In the spring of 1918 the Germans pushed again into France, but were stopped and beaten back with the aid of the Americans, who had entered the war in 1917. This last desperate drive was unsuccessful, and to avoid disaster to the German armies, they were compelled to beat a retreat that became a rout. (See *Marne, Château-Thierry, Argonne, St. Mihiel, Soissons.*)

We must deal more briefly with the events of the war in other fields. On the eastern frontier the large army of Russia was quickly in the field, successfully at first, but meeting with disastrous defeat in the invasion of Poland by the army under Von Hindenburg. Warsaw was lost and the Russians driven out of the Carpathian region. The revolution that eventually overthrew the imperial government of Russia so utterly disorganized that country that its armies practically ceased to exist, and propositions for an armistice between the extremists who gained control of the Russian government and the astute German diplomats were made. Another field of warfare in which Germany took active part was that of Italy, the armies of which had made marked advances upon Triest and Trent, during two years of persistent war with the Austrians. In November, 1917, a strong German army came to the aid of the Austrians and so effectively that the Italians were driven back to the line of the Piave. Later in the war the Italians turned the tables and forced the Austrians to surrender, November 4, 1918. The German armistice, which followed a crushing series of Allied attacks in France was signed November 11, 1918. Germany's navy, beyond a well-fought battle off the coast of Jutland (q. v.), remained for the most part in home ports, and ignominiously surrendered to the Allies without a show of fight. Germany's casualties were estimated at 6,338,000; money expenditure $45,000,000,000.

Kaiser Wilhelm abdicated November 9, 1918, and the German states grouped themselves into a republic, under the temporary leadership of Friedrich Ebert, after a number of outbreaks occasioned by the Bolshevist socialists led by Dr. Karl Liebknecht, who was assassinated in January, 1919.

German Language.—German is one of the Teutonic languages, of Aryan or Indo-European stock. Of these, the Gothic, now long extinct, presents us with the earliest specimens of any Teutonic speech that we possess in the fragments of a translation of the Bible made by Bishop Ulfilas about A.D. 360. Anglo-Saxon comes next; German follows somewhat later. The German dialects spoken in the lower and more northern localities have long exhibited considerable differences from those spoken in the higher and more inland, thus giving rise to the distinction between High German and Low German. Middle High German became literary in the twelfth century, its poetry giving it a predominance as far as Austria. The following century Suabian was the predominant dialect, and its influence is apparent in all the writings of the fourteenth and fifteenth centuries. Ultimately Upper Saxon became the language of literature and cultivated society in consequence of the translation of the Bible by Luther, which may be said to have fixed the New High German.

German Literature.—The literature of Germany received its first impulse from the fondness of the early Germanic races for celebrating the deeds of their gods and heroes. According to Tacitus, the warriors would advance to attack chanting wild war-songs. Of these early songs nothing even in a translated form has been handed down to us. The legends immediately connected with the Gothic, Frankish, and Burgundian warriors of the period of national migration—Dietrich (Theodoric) Siegfried, Hildebrand, etc.—have for the most part some historical foundation, and many of them were eventually incorporated in the *Nibelungenlied*,

the most celebrated production of German mediæval poetry. On the introduction of Christianity was opened another sphere of literary activity. Metrical translations of the Evangelists, the *Krist* and *Heliand*, appeared in the ninth century in the High and Low German dialects, respectively. The *Ludwigslied*, a pæan in honor of the victory of Louis III, king of the Franks, over the Normans in 883, was composed in Old High German by a Frankish ecclesiastic. The preservation of the *Hildebrandlied* is also due to churchmen, who transmitted it partly in the High and partly in the Low dialect. The *Merseburger Gedichte*, two songs of enchantment written in the tenth century, throw light on the ancient religious beliefs of Germany; but in general the hostility of the clergy to the old pagan literature of heroic legends, beast-fables, etc., was not favorable to its preservation.

In the twelfth and thirteenth centuries poetry passed from the monasteries and ecclesiastical schools to the palaces of princes and the castles of nobles. Under the cultured emperors of the house of Hohenstaufen the first bloom of German literature came. Many of the poets of this period were nobles by birth, some of them even princes. Heinrich von Weldeke was the first to introduce into his heroic poem *Eneit* that spirit of devotion to women called by the old Germans *Minne* (Love, hence the name *Minnesänger*, Love-Minstrel). A still greater name is that of Wolfram von Eschenbach, the author of *Parzival*, a poem embodying the legends of King Arthur, the Knights of the Round Table, and the San Graal (Holy Grail). These traditions, together with the exploits of Charlemagne, of Alexander the Great, and the Trojan heroes, inspired also the lays of Gottfried of Strasburg, Hartman von der Aue, and others. These subjects were all taken from the romances of the French *trouvères*, and treated in a style closely resembling theirs. But we have besides real national epics in the *Nibelungenlied* and *Gudrun*. (See *Nibelungenlied, Gudrun*.) The lyrics or minnesongs of this period are not less remarkable than its romances and epics. Perhaps the most gifted lyrist is the celebrated Walther von der Vogelweide. Next to him rank Heinrich von Ofterdingen, Reinmar der alte, and the Austrian poets Nithard and Tannhäuser. Several hundreds of these poets were engaged in traveling from palace to palace and from castle to castle, in the manner of the troubadours of Provence. Their songs were mostly in the Suabian dialect, and the poets constituted what is called the Suabian school. In the thirteenth century didactic poetry began to be cultivated with some success. The dawn of historical literature is heralded by the chronicles of Limburg (1336-98) and of Alsace (1386), but the age of chivalry, as Ulrich von Lichtenstein complained in his poem *Frauendienst*, was declining. During the troublous times of the Interregnum (1256-73) poetry passed to the homes of the private citizen and the workshops. These plebeian songsters formed themselves into guilds in the imperial cities—Nürnberg, Frankfort, Strasburg, Mainz, etc., and were called *Meistersänger*, in contradistinction to the knightly *Minnesänger*.

In the fourteenth century Germany produced several mystical theologians, disciples of Meister Eckhart, the most celebrated of whom were Tauler and Suso, whose sermons and writings paved the way, in some measure, for the Reformation. The only good poetry in the fourteenth, and up to the close of the fifteenth century, were the spirited lays of Halb Suter and Veit Weber, who celebrated the victories of Switzerland over Austria and Burgundy. The invention of printing caused an increasing literary activity, and the works printed in Germany between 1470 and 1500 amounted to several thousand editions. In 1498 there was published the celebrated beast-epic *Reineke Vos* ('Reynard the Fox'). Other popular works were the *Narrenschiff* ('Ship of Fools') of Sebastian Brandt, an allegorical poem in which the vices are satirized; The *Satires* of Thomas Mürner; and (in 1519) *Till Eulenspiegel*, a collection of humorous stories about a wandering mechanic.

In the sixteenth century a new era opens in literature with Luther's translation of the Bible. The writings of Luther, Zwingli (1484-1531), Sebastian Frank (1500-45?), Melanchthon (1497-1560), Ulrich von Hutten (1488-1523), one of the chief writers of the *Epistolæ Obscurorum Virorum*, constitute the principal theological literature of the Reformation. History was now written in a superior style, and with greater comprehensiveness, by Frank in the *Zeitbuch* and *Weltbuch*, and by Sebastian Münster (1489-1552) in his *Kosmographie*; also by Tschudi (1505-72) in *Chronicles of Switzerland* and by Aventinus (1477?-1534), the Bavarian chronicler. The autobiography of Götz von Berlichingen also deserves mention as a sketch of the rude lives of the smaller nobility. Among the poets of this period Hans Sachs (1494-1576), the cobbler of Nurem-

berg, the greatest of the Meistersänger, and Johann Fischart (died 1589), a great satirist, and author of *Das glückhafte Schiff*, stand much above their contemporaries. Many of the hymns and religious lyrics of the age are of high merit, particularly those of Luther, Eber, Waldis, and others. The drama also made considerable progress, Hans Sachs, before mentioned, and Jakob Ayrer (died 1605) being amongst the best writers in this department. But it was in learned and scientific treatises that the age was most prolific. Amongst the chief names in this respect are Luther, Camerarius, Cornelius Agrippa, Paracelsus, Copernicus (astronomy), Leonhard Fuchs (botany and medicine), Conrad Gesner (zoology and classics), and Agricola (mineralogy).

By the beginning of the seventeenth century literature was on the decline. This century is known in German literature as the period of imitation. Most of the poets were graduates of universities; and learned societies were formed for the purpose of improving the language and literature. A new school of poetry, known as the first Silesian school, was founded, of which Martin Opitz (1597-1639) was the leader. His works are more remarkable for smoothness of versification than for true poetic inspiration. As a critic his work *Die Deutsche Poeterie* became a kind of manual for verse makers. Amongst the chief members of the Silesian school were Simon Dach (1605-69), von Zesen (1619-89), Johann Rist (1607-67), and, greatest of all, Paul Fleming (1609-40), whose lyrics are natural and cheerful as the songs of a lark. Of this school also was Andreas Gryphius (1616-64), who may be said to have founded the regular German drama. The second Silesian school, headed by Hoffmann von Hoffmannswaldau (1618-79), and Lohenstein (1635-83), carried affectation to its utmost. Both the Silesian schools were opposed by the 'court poets,' Canitz (1654-99), Besser (1654-1729), and many others who imitated the French school and took Boileau for their guide. Germany's greatest hymn-writer, Gerhardt (1606-75), belongs to this period. Among the best satirists and epigrammatists were Logau (1604-55) and Lauremberg (1591-1659). Amongst novelists Moscherosch, with his *Geschichte Philanders von Sittewald*, and Grimmelshausen in his *Simplicissimus* give graphic pictures of life during the Thirty Years' war. Amongst the scientific and philosophic writers of the period we may mention Kepler (1571-1631), Pufendorf (1632-94), the publicist, and Jakob Böhme (1575-1624), the great mystic who stood almost alone in using the vernacular in communicating philosophical instruction. Leibnitz (1646-1716) was the first to lay a scientific basis for the study of philosophy, but his works were composed chiefly in French and Latin. Wolff (1679-1754), his disciple, shaped the views of his master into a comprehensive system, and published his works in the German language.

In the eighteenth century poetry revived with Haller (1708-77), remarkable as a descriptive poet, and Hagedorn (1708-54), a lyrist of considerable merit. The Saxon school headed by Gottsched (1700-66) aimed at a reformation of German poetry in the direction of French clearness and correctness, modeling the drama as far as possible on the works of Corneille and Racine. These tendencies brought about a violent controversy with a group of writers in Zürich, known as the Swiss school, and headed by Bodmer and Breitinger, who took the English poets as their model, and laid stress on the function of imagination and feeling in poetry. The result of the controversy was that most of the young writers at Leipzig shook off the authority of Gottsched, and even established a periodical (*The Bremer Beiträge*) in which the principles of their former master were attacked. Among the contributors were Rabener (1712-91), a popular satirist with a correct and easy style; Zachariä (1726-77), a serio-comic epic poet; Gellert (1715-69), the author of numerous popular hymns, fables, and a few dramas now forgotten; Kästner (1719-1800), a witty epigrammatist and talented mathematician; Giseke, Cramer, Fuchs, Ebert, and many others of more or less note. To the school of Halle belonged Kleist (1715-59), Gleim (1719-1803), a celebrated fabulist, and others. Gessner of Zürich (1730-87) gained in his time a high reputation as a writer of idyls. With the writings of Klopstock (1724-1803) and Wieland (1733-1813) the classical period of German literature (usually reckoned from 1760) may be said to begin. Though the epic poem of the first (*Messias*) is no longer counted a poem of the first rank, yet Klopstock's work, with its ardent feeling for the spiritual and sublime, is recognized to have had a beneficent effect on German literature. Wieland, a striking contrast to Klopstock, awakened with his light and brilliant verse a greater sense of gracefulness in style. But it was reserved for Gotthold Ephraim Lessing (1729-81) to give a new direction to German literature. He established a new school of

criticism and dealt the fatal blow at French influence. His tragedy, *Emilia Galotti*, his comedy of *Minna von Barnhelm*, and his philosophic drama *Nathan der Weise*, were the best models of dramatic composition which German literature had yet produced, and his direction of the German mind toward Shakespere and the English drama was not the least of the many impulses he contributed to the literary growth of his countrymen. Herder (1744-1803), with his universal knowledge and many-sided activity, followed Lessing as another great influence in the literary world. The researches of Winckelmann (1717-68) in ancient sculpture led to a new understanding of art, as those of Heyne in ancient literature mark the development of modern German scholarship. A union of the students at Göttingen University, where Heyne taught, gave rise to the *Göttinger Dichterbund* or *Hainbund*, among the members of which were Gottfried Aug. Bürger (1748-94), author of *Lenore* and other wild and picturesque ballads and songs; Voss (1751-1826), the translator of Homer, and author of one of the finest German idyls, *Luise*, together with the two brothers Stolberg, Boie, Hölty, Claudius, etc.

This period was followed by a time of transition and excitement known in Germany as the *Sturm-und-Drang Periode* (Storm and Stress period), which found its fullest expression in an early work of Goethe's (1749-1832), the *Sorrows of Werther*. The literary excitement was raised to the highest pitch by the *Räuber* ('Robbers') of Schiller (1759-1805), afterwards the friend and coadjutor of Goethe. By the joint exertions of these two great men German literature was brought to that classical perfection which, from a purely local, has since given it a universal influence. Of a highly individual character are the works of Jean Paul Richter (1763-1825), a writer of profound humor and pathos; and Jung Stilling (1740-1817), whose autobiography holds a peculiar place in German literature for the charming naïveté of its thought and style. In the departments of science and philosophy, we have the names of Moses Mendelssohn (1729-1786); A. G. Baumgarten (1714-62), the founder of the science of æsthetics; the historians Mosheim (1694-1755), Dohm, Möser, Spittler, Johannes Müller; Adelung, the philologist; Basedow and Pestalozzi the educationalists; Ernesti, Spalding, Rosenmüller, and Michaelis, theologians; Eichhorn in theology and universal and literary history; and the scientific writers Blumenbach, Euler, Vega, Herschel, and others. In the field of pure metaphysics Immanuel Kant (1724-1804), was succeeded by Fichte (1762-1814), Hegel (1717-1831), and Schelling (1775-1854).

Partly produced by the influences of the *Sturm-und-Drang* period, and partly trained in the laws of art laid down and worked out by Goethe and Schiller in their many famous and admirable works, the so-called *romantic school*, distinguished by its enthusiasm for mediæval subjects and its love of what is mysterious and transcendental in life or thought, gradually succeeded in gaining public attention about this epoch. Amongst the principal writers of this school after its two great leaders are von Hardenberg, better known as Novalis (1772-1801), a pensée-writer of deep poetic insight; Ludwig Tieck (1773-1853), a writer of tales, dramas, and dramatic criticisms; La Motte Fouqué, Clemens Brentano, Hoffman, Musæus, Werner, von Kleist, etc. The two Schlegels (August Wilhelm, 1767-1845, whose translation of Shakespere is still celebrated, and Friedrich, 1772-1829, best known by his philosophy of history) also belong to this school.

The war of liberation against Napoleon I introduced a strong manly enthusiasm for a time into the hitherto gloomy and melancholy productions of the romanticists. Among the patriotic poets of the time Ernst Moritz Arndt (1769-1860) and Theodor Körner (1791-1813) hold the first place. The ballads and metrical romances of Ludwig Uhland (1787-1872) brought him a world-wide fame. Friedrich Rückert (1789-1866) also may be noticed as a lyric poet of merit. During the excitement produced by the July Revolution in France (1830) a school of writers arose in whose works the social and political ideas of the time were strongly reflected. The most prominent names among this party are Ludwig Börne (1786-1837) and Heinrich Heine (1799-1856), whose writings combine the keenest satire and the finest pathos. Among the better known members of the school is Karl Gutzkow (1811-1878), a popular dramatist and novelist. As in England and France of late, the novel, especially the novel of a social or political character, has taken a prominent place in literature. Most distinguished are Gustav Freytag, Fr. Spielhagen, Paul Heyse, Berthold Auerbach, Fanny Lewald, Hackländer, Reuter, etc. Of late, however, science and learning rather than literature and the arts have produced the names of most eminence. Alexander von Humboldt (1769-1859), one of the first and

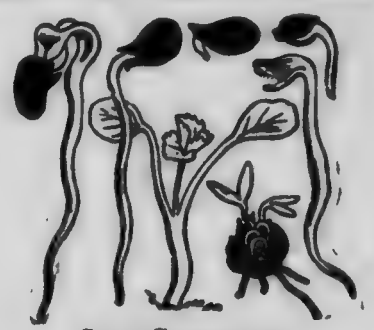
most eminent of these, gave a great impulse to almost all branches of knowledge by his *Cosmos*, his *Travels*, and his *Views of Nature*, and by the general suggestiveness of his labors. In history, Niebuhr and Theod. Mommsen, the historians of Rome; Leopold Ranke, the historian of the popes; Dahlmann, Gervinus, Sybel (French Revolution), Giesebrecht, Julian Schmidt, H. Kurz, and others may be mentioned. Biography has been well represented by Varnhagen von Ense, Pertz, David F. Strauss, and others. German modern theology and Biblical criticism has had lately much influence in the religious world. Baur, Bleek, and Ewald are some of the widely-known names. Histories of art have been written by Kugler, Burckhardt, Lübke, and others. The brothers Grimm—Jakob (1785-1863), Wilhelm (1786-1859), were the founders of a new branch of philological and poetic investigation in ancient German literature. Eminent names in general philological science are those of Bopp, Pott, Schleicher, Steinthal, and Friedrich Müller. In natural sciences, Oken, Burmeister, Carus, Cotta, Liebig, Helmholtz, Virchow, Schleiden, Grisebach, Vogt, Bessel, Brehm, Häckel, Bastian, etc., are the eminent names; in philosophy, Schopenhauer, Feuerbach, Rosenkranz, Kuno Fischer, von Hartmann, Lotze, etc. Amongst recent poets Anastasius Grün (pen-name of Count von Auersperg) and Nikolas Lenau amongst Austrian, and Meissner and Hartmann, natives of Bohemia, have a considerable reputation. Herwegh, Hoffmann von Fallersleben, Freiligrath, and Franz Dingelstedt have infused strong political sentiments into their poetry. Emmanuel Geibel, von Scheffel, Bodenstedt, and others represent a poetry more comprehensive in its aims and tendencies. To these might have been added numerous names of still later date, recent German literature having become very voluminous, though none of the existing writers have yet won eminence.

Germersheim (ger'-mērs-hīm), a town and fortress in the Bavarian Palatinate on the Rhine, 8 miles s. w. of Spier. Pop. (1905), 5914.

Germinal (Fr. zhăr-mē-nal), the seventh month of the first French republican calendar, March 21—April 19.

Germinal Vesicle (jer'mi-nal), (*a*) in animal physiology, the nucleus of the ovum or egg of animals. It contains within it a nucleolus called also the *germinal spot*. The germinal vesicle undergoes important changes in the early stages of the development of the egg into the embryo. (*b*) In botany a cell contained in the embryo sac, from which the embryo is developed.

Germination (jer-mi-nā'shun), the first act of growth by an embryo plant. The immediate causes of germination are the presence of moisture and atmospheric air and a certain elevation of temperature. Moisture softens the integuments of the seed and relaxes the tissue of the embryo; atmospheric air supplies oxygen and nitrogen; and a temperature which must be at least as high as 32° Fahr., by exciting the



Seeds Germinating.
In center a plant which has newly appeared above ground.

vitality of the embryo, enables it to take advantage of the agents with which it is in contact. During germination various changes take place in the chemical constituents of the seed, and are usually accompanied with increase of temperature, as is seen in the process of malting. Along with these other changes commonly take place: a root is produced, which strikes perpendicularly downwards and, fixing itself in the soil, begins to absorb food; a growth upwards then commences and ends in the protrusion of a stem and leaves.

Germ Theory of Disease,

the theory that certain diseases are communicated from an infected person to an uninfected one by living organisms which gain access to the body of the afflicted person by the air or food, or drink, and which, growing and multiplying in the body they invade, produce the changes characteristic of the particular disease. The period during which the living particles of contagious matter retain their vitality, like the rate of their growth and multiplication, varies in different cases, but it is limited in all. Few, if any, resist the destructive influence of a temperature of 300° Fahr., while most succumb at the temperature of 200° or even less, particularly if exposed for some

time. Many of them are capable, however, of withstanding great reduction of temperatures. Animal poisons generally are destroyed by boiling, and clothes, sheets, etc., infected, may be rendered pure by being exposed to a temperature of 300° Fahr. These living organisms are grouped together as microbes or micro-organisms, and are divided into different classes. The *micrococcus* is a round form about the 32,000th of an inch in size, and multiplies by fission. The *bacterium* is rod-shaped, about the 10,000th of an inch long, with rounded ends; it also multiplies by fission. The *bacillus* is a third form also rod-shaped, and somewhat larger than the bacterium. They often form long chains or threads, and increase by division and by spore formation. *Vibrio* and *spirillum* are somewhat similar forms; and, like the others, increase with a rapidity beyond conception. The connection between these micro-organisms and the various forms of zymotic disease has been thoroughly established. The only method of investigation that yields reliable results, is to separate the organism supposed to be the cause of the disease, and cultivate it outside of the body. Thus a drop of blood from a person suffering from a special disease, which contains the bacteria, or bacilli, etc., believed to be the producers of the disease, is placed in a flask containing a nourishing material, care having been taken to destroy all other organisms in the flask. The special microbe flourishes there, let us suppose. It is then cultivated in one flask after another through successive generations, only a single minute drop of the material in one flask being used to inoculate a succeeding one. In this way a pure cultivation is obtained, a cultivation, that is, containing the particular microbe and none other. If this is the true cause of the disease, then a drop of the solution containing it introduced into the body of an animal, capable of receiving the disease, ought to produce it, and the particular organism introduced should be found multiplying in the blood and tissues of the infected animal. Such a demonstration has been given of the cause of a few diseases. Dr. Koch, of Berlin, published in 1876 a paper giving a full account of the life history of the bacillus organism which had been observed in animals dead of splenic fever; and in 1877 the great French chemist, Pasteur, proceeded to investigate the subject, and his investigations conclusively support the germ theory of disease. In 1882 Dr. Koch, of Berlin, announced the discovery of a micro-organism in tuberculosis, sometimes called consumption when infecting the lungs. This is found not only in the lungs of persons who have died of tubercle, but also in the saliva of tubercular and consumptive patients, and multiplies also by spores. Thus it is that the spittle of a consumptive patient, even after it has dried up, may be capable of imparting the disease, owing to spores being scattered in the air. After the epidemic of cholera in Egypt in 1883, which spread to France and Italy, investigations were undertaken by French, German, and British commissioners. Dr. Koch detected a peculiar bacillus, shaped like a comma (,), in the intestines of persons who had died of cholera, in the discharges from cholera patients, etc. He believed that this bacillus was the active agent in the production of the disease. All investigation, in short, seems to point to the fact that every infectious or contagious disease is due to some form of micro-organism, and that there is one particular organism for each particular disease. Each organism produces its own disease and none other; and the special disease cannot arise unless its germ has gained entrance to the body. The channels through which these germs obtain entrance are innumerable, but they have one origin and one only, and that is a preceding case of disease. In the case of cholera and typhoid fever the deleterious microbes seem generally conveyed by impure drinking water; the germs of some other diseases appear to be transmitted by the air; others are conveyed by insects, as yellow fever by one species of mosquito, malaria by a second species, and sleeping sickness by the tsetse fly; even our common house fly is known to be a source of danger in this direction. The 'germ theory' affords the hope and suggestion of a method of diminishing, if not of getting rid of, such diseases altogether, and to some extent also indicates the direction in which their cure is to be sought. If the particular microbe of each contagious disease were known, the condition of its life and activity understood, there is great probability that its multiplication in the living body could be arrested, and the disease thus cured. Even without such knowledge, however, the germ theory indicates that the means for arresting the spread of contagious diseases and diminishing their occurrence consist in preventing the spread of the germs from an existing case of disease. It is well to state that the disease-bearing microbes are only a few of the many species known, the most of them being harmless and really of great benefit to mankind,

in various ways. Also to state that these organisms are not all vegetable, like the bacteria, some of them being animal. See *Disinfectant*.

Gérôme (zhā-rōm), JEAN LÉON, a French painter, born in 1824 at Vesoul. He went to Paris and studied under Paul Delaroche. In 1853 he traveled in the East. In 1855 the first of his great pictures, *The Age of Augustus* and the *Birth of Christ*, appeared, and four years later his picture of the Roman gladiators, *Ave Cæsar Morituri te salutant*. In 1861 he exhibited his celebrated *Phryne before her Judges*.

Jean Léon Gérôme

His other works include *Death of Cæsar*, *The Plague at Marseilles*, *Rex Tibicen*, *L'Eminence Grise*, and *various scenes* from Oriental life. M. Gérôme was decorated with the Prussian order of the Red Eagle and made a commander of the legion of honor. He died in 1904.

Gerona (hā-rō'nâ), a fortified town of N. E. Spain, capital of the province of Gerona, in Catalonia, at the confluence of the Oña and the Ter, 52 miles northeast of Barcelona. It consists of an old and a new town, the former on the slope of a hill, with antiquated houses and a stately cathedral. There are spinning and weaving; also paper factories. Gerona was once the residence of the Kings of Aragon, and as a place of strategic importance has sustained many memorable sieges. Pop. 15,787.—The PROVINCE, area 2270 square miles, abuts on the Mediterranean, is mountainous and mostly rugged, but with many fertile valleys, which produce olives, wine, wheat, rye, etc. Pop. 299,287.

Geronimo (jē-ron'i-mō), an Apache chief, noted in American frontier history. In 1884 and 1888, at the head of a band of hostile Indians, he was active in Arizona, committing many outrages on the white settlers. He surrendered to General Crook, in 1886, under an agreement that his band and their families should reside for two years in the East. But while negotiations were pending, he escaped with his followers to the mountains, where he remained until driven to exhaustion by General Miles. He and his associates were finally settled at Fort Sill, Okla.

Gerry (jer'ri), ELBRIDGE, statesman, born in Marblehead, Massachusetts, in 1744. He was a member of the Continental Congress; delegate to the Constitutional Convention; member of congress 1789–93; commissioner to France 1792–98; governor of Massachusetts 1810–12, and Vice President of the United States from March 4, 1813, till his death, November 23, 1814.

Gerrymander (ger'i-man-der), in American political history the name, first used in Massachusetts in 1812, given to an unfair political arrangement of electoral districts. It had its origin from a bill signed by Gov. Elbridge Gerry, which so apportioned a senatorial district in Republican interests that from its fantastic shape on the map it was said to resemble a salamander. Gerrymander was substituted for salamander, and the name persists to this day, although Governor Gerry was not responsible for the bill he signed.

Gers (zhār), a department in the s. w. of France, separated from the Bay of Biscay by the department of Landes; area 2425 square miles. The southern part is covered with ramifications of the Pyrenees separated by valleys, each of which is watered by its own stream. The chief of these are the Gers, Losse, Save, etc. More than half the land is under the plow, and about a seventh in vineyards. Much of the wine is made into Armagnac brandy. Auch is the capital. Pop. (1906) 231,088.

Gerson (zhār-sōn), JEAN DE, properly JEAN CHARLIER, a celebrated French theologian, born at Gerson in 1363. He was ardent and courageous in advocating improvements and reforms. When the Council of Constance (1414–18) in which he took a leading part, proved unable to settle the differences

existing in the church, he at last gave up the struggle in despair, and not daring to return to France, where his enemies had then the upper hand, sought shelter for a time in Bavaria and Austria. In 1419 he returned to his native country, and spent the last ten years of his life with his brother, the prior of a community of Celestine monks at Lyons, living an ascetic life, and devoting himself to religious meditation and the composition of theological and other treatises. The authorship of the *Imitation of Christ*, by Thomas à Kempis, was at one time erroneously ascribed to him.

Gerstäcker (ger-stek'ĕr), Friedrich, a German traveler and novelist, born at Hamburg in 1816; died in 1872. In 1837 he came to America, where he earned a living by the most various employments—as a sailor, stoker, innkeeper, woodcutter, and trapper and hunter in the prairies of the west. He returned to Germany in 1843, and began his literary life by the publication of his experiences in America, *Streif- und Jagdzüge durch die Vereinigten Staaten Nordamerikas* (Dresden, 1844). This was followed by *Die Regulatoren in Arkansas; Die Flusspiraten des Mississippi; Mississippibilder*, etc. In 1849 Gerstäcker was engaged on behalf of the German government to collect information which might be useful to German emigrants. The results were published under the title of *Reisen* in 1853. He afterwards made voyages to South America, to Egypt, West Indies, and other places, which are described in his *Neue Reisen* (1868). Amongst his many romances (most of which may be had in English) are *Die beiden Sträflinge* (1856), *Im Busch* (1864), *General Franco* (1865), *Californische Skizzen* (1856), and others.

Gerund (jĕr'und), the name given originally to a part of the Latin verb which possesses the same power of government as a verb, but also resembles a noun in being governed by prepositions. In early English or Anglo-Saxon a dative form of the infinite is used to indicate purpose, and is often called the gerund. In modern English what seems to be a present participle governed by a preposition is sometimes denominated a gerund, in such phrases, for example, as 'fit for teaching'; but this is merely a verbal noun representing the old Anglo-Saxon noun ending in *-ung*.

Gervaise, or Gervase (jer'vās), a monk of Canterbury, born in 1150. Amongst his writings is an important chronicle, *Chronica de tempore regum Angliæ, Stephani, Henrici II et Ricardi I.* It is reprinted in Twysden's collection. Gervaise died probably about 1200.

Gervaise (or Gervase), of Tilbury, a chronicler of the twelfth and thirteenth centuries, born at Tilbury in Essex about the middle of the twelfth century. Having completed his studies in England, he visited the courts of Italy and of Germany, was appointed by Otto IV Marshal of the Kingdom of Arles. He died, according to some in 1218. His chief works are *Otia Imperialia* (containing a history of the kings of France and England); *Illustrationes Galfridi Monemuthensis* ('Illustrations of Geoffrey of Monmouth'); *Historia Terræ Sanctæ* ('History of the Holy Land'); *De Origine Burgundiorum* ('On the Origin of the Burgundians'). Most of his writings still remain in manuscript in the Cottonian collection and the Corpus Christi library, Cambridge.

Gervas (jer'vas), a small shrub, the *Stachytarpheta Jamaicensis*, nat. order Verbenaceæ, a native of the West Indies and warm parts of America, the leaves of which are sold in Austria under the name of Brasilian tea, and used in Britain to adulterate tea.

Gervinus (ger-vē'nus), Georg Gottfried, a German critic and historian, born at Darmstadt in 1805. He quitted commerce in 1825 to study at Heidelberg, was for some time a teacher, and qualified as a privatdocent. After a visit to Italy he published his *Geschichte der Poetischen Nationalliteratur der Deutschen* ('History of the Poetic National Literature of the Germans'). In 1835 he was appointed extraordinary professor at Heidelberg, and the following year ordinary professor of history and literature at Göttingen; but in 1837, being one of the seven professors who protested against King Ernst August's breach of the constitution, he was banished from Hanover. After another visit to Italy he returned to Heidelberg, where in 1844 he was appointed an honorary professor. He now began to take an active part in politics on the liberal side; became editor of the newly-founded *Deutsche Zeitung*, and was returned to the federal diet by the Hanse towns. Discontented with the tendency of affairs after 1848, he gave up politics and resumed his old studies. In 1849 he published the first of his great work on Shakespere, in 1853 his *History of German Poetry*, and in 1855 the first volume of his *History of the Nineteenth Century*, which, however, was never carried farther than the French revolution of 1830. Amongst his last writings was

a critical essay on *Handel and Shakespere*. He died in 1871.

Gesenius (ge-sē'ni-us), FRIEDRICH HEINRICH WILHELM, a German orientalist and Biblical critic, born in 1786, studied at Göttingen, and became professor of theology at Halle. In 1810-12 his *Hebrew and Chaldee Dictionary of the Old Testament* appeared. In 1820 he visited Paris and Oxford for the purpose of collecting materials regarding the Semitic languages. In 1829 he published his large *Thesaurus philologico-criticus Linguæ Hebraicæ et Chaldaicæ*, completed in 1858 by Rödiger. Besides the works mentioned, Gesenius wrote a *Hebrew Grammar*, a history of the Hebrew language, and notes to the German translation of Burckhardt's *Travels in Syria and Palestine*. He died in 1842.

Gesner (ges'nėr), ABRAHAM, geologist, born at Cornwallis, Nova Scotia, in 1797; died in 1864. He was appointed in 1838 to examine the geological resources of the lower provinces of Canada, and discovered how to produce oil for lamps from bituminous shale and cannel coal. To this oil he gave the name of 'kerosene.'

Gesner (ges'nėr), KONRAD VON, a German, born at Zürich in 1516, studied at Strasburg, Bourges, and Paris, and became schoolmaster in his native town. Hoping to raise himself from his needy condition, he went to Basel, and devoted himself particularly to the study of medicine. Afterwards he became successively professor of Greek at Lausanne, and of philosophy at Zürich. He did important work in the departments of history, zoology, and botany. His *Bibliotheca Universalis* is a descriptive catalogue of all writers extant in Greek, Latin, and Hebrew. His *Historia Animalium* must be regarded as the foundation of zoology; and in botany he was the inventor of the method of classifying the vegetable kingdom according to the characters of the seeds and flowers. He died of the plague at Zürich, 1565.

Gesneraceæ (ges-ner-ā'se-ē), an order of monopetalous exogens, typical genus *Gesnera*. There are many species, mostly natives of tropical and subtropical regions. They are shrubby herbs, often with tuberous rhizomes, and scarlet, violet, or blue flowers. Some of the genera are frequent in our hothouses, such as Gloxinia, Achimenes, Gesnera, etc.

Gessler. See *Tell*.

Gessner (ges'nėr), SALOMON, a German poet and artist, was born at Zürich in 1730; died there in 1787. In 1749 he was sent by his father to learn the business of bookselling at Berlin, but having taken a dislike to the business he maintained himself by executing landscapes. On his return to Zürich he published *Daphnis*, a small volume of idyls, and *Tod Abels* ('The Death of Abel'), a kind of pastoral idyl in prose. These idyls acquired for him a great reputation amongst contemporaries. For some years afterwards he devoted himself to the engraving art, in which he also became very eminent.

Gesta Romanorum (ges'ta rō-ma-nō'rum; 'Deeds of the Romans'), the usual title of a collection of short tales, legends, etc., in Latin, very popular during the middle ages. The book was probably written about the close of the thirteenth century by a certain monk Elinandus, an Englishman or a German. The separate tales making up the *Gesta* are of very various contents, and belong to different times and countries, the sources from which they are derived being partly classical, partly oriental, and partly western. Whatever may have been the intention of the original compiler, they very soon were adapted to the moralising tendencies of the time, and moral reflections and allegorical interpretations were added to them, it is said, by a Petrus Bercorius or Pierre Bercaire of Poitou, a Benedictine prior. After the Reformation the book fell into oblivion.

Gestation (jes-tā'shun; Latin, *gestare*, to bear), in physiology, the name given to the interval which elapses between the impregnation of any of the mammalia and the period of birth. This period varies from 25 days, in the case of the mouse, to 620, in that of the elephant.

Geste, CHANSONS DE. See *France—Literature*.

Getæ (ge'tē), an ancient people of Europe, dwelling at first in Thrace; afterwards a part of them moved west on the north bank of the Danube, where they were known to the Romans as the Daci. (See *Dacia*.) Another portion moved east into Asia.

Gethsemane (geth-sem'a-nē; 'oil-press'), an olive garden or orchard in the neighborhood of Jerusalem, memorable as the scene of the last sufferings of our Lord. The traditionary site of this garden places it on the east side of the city, a very little beyond the Kedron, near the base of Mt. Olivet. It contains some very old olive-trees, piously regarded as having stood there in the time of our Lord.

Gettysburg (get'tis-burg), a city, the capital of Adams County, Pennsylvania. Here are the Pennsylvanian College (Lutheran), founded in 1832; the national cemetery for Union soldiers, and a national homestead for the orphans of Union soldiers. At Gettysburg a battle was fought (July 1, 2 and 3, 1863) between the Union forces under General Meade and the Confederate forces under General Lee, in which the latter suffered defeat. This great battle was the turning point in the Civil war, the critical event in the great struggle of the North and South, and in consequence the battlefield has been converted into a national park, adorned with numerous monuments erected by the regiments engaged. To these, in 1910, the State of Pennsylvania added a noble monument, on which are inscribed the names of all Pennsylvanians who took part in the battle. Pop. 4030.

Geum (jē'um), a genus of hardy herbaceous perennials, belonging to the nat. order Rosaceæ, chiefly natives of the northern parts of the world. *G. Canadense*, chocolate-root, or bloodroot, a North American species, has some reputation as a tonic. A species of saxifrage is also called *Geum*.

Geyser (gī'zer), a slight alteration of the Icelandic name *geysir*, from *geysa*, to gush or rush forth, and applied to natural springs of hot water of the kind that were first observed in Iceland. The geysers of Iceland, about a hundred in number, lie about 30 miles N. W. of Mount Hecla, in a plain covered by hot springs and steaming apertures. The two most remarkable are the Great Geyser and the New Geyser or Strokkur (churn), the former of which throws up at times a column of hot water to the height of from 80 to 200 feet. The basin of the Great Geyser is about 70 feet across at its greatest diameter. The New Geyser, which is only 100 yards distant, is much inferior in size. The springs are supposed to be connected with Mount Hecla, and the phenomenon of eruption has been explained by Tyndall as due to the heating of the walls of a fissure, whereby the water is slowly raised to the boiling point under pressure, and explodes into steam, an interval being required for the process to be repeated. The geysers of Iceland, however, have been surpassed by those discovered in the Rocky Mountains in the Yellowstone region of the State of Wyoming, the largest of which throw up jets of water from 90 to 250 feet high. (See *Yellowstone*.) The hot-lake district of Auckland, New Zealand, is also famous in possessing some of the most remarkable geyser scenery in the world. These phenomena are of three kinds; the puias (fire-springs), geysers continually or intermittently active; mgawhas or inactive puias, which emit steam, but do not throw up columns of water; and waiariki or hot-water cisterns. This region formerly was remarkable for the number of natural terraces containing hot waterpools or cisterns, and its lakes all filled at intervals by the boiling geysers and thermal springs, but the configuration of the country was considerably altered by a disastrous volcanic outbreak in 1886, its beautiful pink and white terraces being destroyed. Ngahapu or Ohopia, a circular rocky basin, 40 feet in diameter, in which a violent geyser is constantly boiling up to the height of 10 or 12 feet, emitting dense clouds of steam, is one of the natural wonders of the southern hemisphere, and is much visited by tourists traveling through New Zealand.

Ghadames (ghà-dā'mes), a town of North Africa, in the southwest of Tripoli. It is about 310 miles S. W. of the town of Tripoli, is situated in the midst of an oasis, and is the center of caravan routes to Tunis, Tripoli, etc. Figs, dates, barley, wheat, etc., are grown in the gardens, which are watered by a hot-spring. Pop. about 7000.

Ghagra, or GHOGRA. See *Gogra*.

Ghara, or GARRA (gär'rà), a river in the Punjab, being the name by which the united streams of the Bias and Sutlej are known, from their confluence at Endrisa to the junction with the Chenab, after which the united waters flow under the name of the Punjnad to the Indus. The Ghara is about 300 miles long.

Ghâts (gäts), or GHAUTS, EASTERN and WESTERN, two ranges of mountains in the peninsular portion of Hindustan, the former running down the east side of India, but leaving broad tracts between their base and the coast; the latter running down the west side, but leaving only a narrow strip between them and the shore. Both meet near Cape Comorin. The general elevation of the Western Ghâts varies from 4000 to 7000 feet. Its best known portion is the Neilgherries, with Dodabetta Peak, their highest point 8760 feet above the sea. The Western Ghâts form a watershed, and the rain collected on its eastern slopes makes its way right across India to the Bay of Bengal. They are covered with fine forests, and have most picturesque scenery. The Eastern Ghâts are of

considerably less elevation, on the average about 1500 feet, and have none of the beauty of the western range. They are, however, rich in metals.

Ghâts (gäts), or GHAUTS, a Hindu term employed to designate landing-stairs on a river, especially when

Ghoosla Ghât, Benares.

large and substantially constructed. These ghâts are very numerous on the Ganges, and are great places of resort by the people of the towns where they

Bathing Ghâts on the River Jumna at Muttra.

are situated. Some of them are noteworthy from an architectural point of view, having temples, bathing-houses, etc., at the top.

Ghazipur (gä-zē-pör'), a town in Hindustan, headquarters of the Ghazipur District, Northwestern Provinces, about 44 miles northeast of the town of Benares. It stretches along the banks of the Ganges; has a trade in sugar, tobacco, rose-water, and otto of roses; and is a healthy place. The ruins of the Palace of the Forty Pillars, and a monument to Lord Cornwallis, who died here in 1805, are here. Pop. 39,429. The district, one of the hottest and dampest in the N. W., has an area of 1473 sq. miles.

Ghazni (gäz'nē), GHUZNEE, or GHIZNI, an ancient and celebrated city and fortress in Afghanistan, 84 miles S. S. W. of Cabul, on an eminence 7726 feet above sea-level. The wall embraces the whole of the hill; the houses are of mud; the streets, dark, narrow, and irregular. The country round Ghazna is very productive in grain, fruits, tobacco, etc. Three miles northeast are the ruins of the ancient city, which under the celebrated Sultan Mahmud (999-1030) (see *Ghaznavides*), was the capital of a great empire. It has been twice taken by British forces (1839 and 1842). Pop. est. about 10,000.

Ghaznavides (gäz'-na-vidz), a dynasty founded in 961 by Alepteghin, originally a slave belonging to the Ameer of Bokhara. Ghazna was the seat of his power, and became, under his successors, the capital of an empire which reached from the Tigris to the Ganges, and from the Sihon to the Indian Ocean. The most brilliant period of the dynasty was that of Sultan Mahmud (999-1030). It became extinct towards the end of the twelfth century after having lost most of its possessions.

Ghebers (gē'bèrz). See *Guebres*.

Ghee (gē), or GHI, a peculiar kind of butter in use among the Hindus. It is made from the milk of the buffalo or the cow. The milk is boiled for an hour or so, and cooled, after which a little curdled milk is added. Next morning the curdled mass is churned for half an hour; some hot water is then added, and the churning continued for another half-hour, when the butter forms. When after a few days it becomes rancid, it is boiled till all the water is expelled, and a little more curdled milk added with some salt or betel-leaves, after which it is put into pots. In this state it will keep for a long time. It is too strong for European taste, but is a favorite article of consumption amongst rich Hindus.

Gheel (gāl), a village and commune in Belgium, 26 miles E. S. E. of the town of Antwerp and in the province of that name. It is situated in a fertile spot in the midst of a sandy waste, and is inhabited by a class of peasant farm-

ers. It has manufactures of cloth, hats, wax and tallow candles, etc.; tanneries, dyeworks, ropeworks, etc., and a considerable trade in butter. The commune has been long remarkable for containing a colony of deranged persons, numbering at present about 1600, who are lodged and boarded in the houses of the country people, who make use of their services, when available, in field and other labor. Little or no restraint is employed, and the best effects thence ensue. Lately a hospital has been erected, with a medical staff, for the supervision of the relations between the insane and their custodiers. Patients are sent hither from all parts of Belgium. Pop. 14,087.

Ghent (gent; French, *Gand;* Flemish, *Gend* or *Gent*), a town in Belgium, capital of the province of East Flanders, in a fertile plain at the confluence of the Lys with the Scheldt. It is upwards of 6 miles in circumference, and is divided by canals into a number of islands connected with each other by bridges. Except in some of the older parts it is well built, and has a number of fine promenades and many notable buildings. Amongst the latter are the cathedral of St. Bavon, a vast and richly-decorated structure, dating from the thirteenth century; the church of St. Nicholas, the oldest in Ghent; the church of St. Michael, with a celebrated *Crucifixion* by Vandyk; the university, a handsome modern structure, with a library of about 100,000 volumes and 700 MSS.; the Hôtel-de-Ville; the Belfry, a lofty square tower surmounted by a gilded dragon, and containing a fine set of chimes consisting of forty-four bells, one of which is the famous 'Roland of Ghent'; the new Palais de Justice; the Marché du Vendredi, an extensive square, interesting as the scene of many important historical events; and Les Béguinages, extensive nunneries founded in the thirteenth century, the principal occupation of whose members is lacemaking. Ghent has long been celebrated as a manufacturing town, especially for its cotton and linen goods and lace. Other industries of importance are sugar-refining, hosiery, thread, ribbons, instruments in steel, carriages, paper, hats, delftware, tobacco, etc. There are also machine-works, engine-factories, roperies, tanneries, breweries, and distilleries. The trade is very important. A canal 16 feet deep and 11 yards wide, connects it with the Scheldt at Terneuzen, but is less used than it might be on account of the heavy imposts levied by Holland on vessels passing through. Another canal connects the Lys with the canal from Bruges to Ostend. A new dock, capable of holding 400 vessels, was opened in 1881. Population, 162,482. It is mentioned as a town in the seventh century. In the ninth century Baldwin, the first count of Flanders, built a fortress here against the Normans. Under the counts of Flanders Ghent continued to increase, and in the fourteenth century could send 50,000 men into the field. The wealth and liberty of its citizens disposed them to a bold maintenance of their privileges against the encroachments of feudal lords like the Dukes of Burgundy and the Kings of Spain. In 1792 the Netherlands fell under the power of France, and Ghent became the capital of the department of Essaut (Scheldt). In 1814 it became, along with Flanders, part of the Netherlands, till the separation of Belgium and Holland. See *Belgium.*

Ghent, TREATY OF, the treaty which brought to a close the war between the United States and Great Britain, 1812-14. It was negotiated at Ghent, Belgium, by representatives of the two countries, and was signed on December 24, 1814. Although the United States had gone to war primarily because Great Britain had impressed American seamen and hampered American commerce, no mention was made of either in the treaty. As ratified it declared for 'firm and universal peace' and stipulated that all territory (with the exception of the Passamaquoddy islands), taken during the war should be returned.

Gherardesca (gā-rär-des'kä), a family of Tuscan origin which plays an important part in the history of the Italian republics of the middle ages. Historically the most prominent member of the family is Ugolino, whose death, and that of his two sons and grandsons, by starvation in the 'Tower of Hunger,' is described in one of the celebrated passages of Dante's *Divina Commedia.*

Ghetto (get'to), the name frequently applied to the Jewish quarter of large cities.

Ghibellines (gib'el-lins), the name of a political party in Italy, which, in general, favored the claims of the emperor against those of the pope. The name is said to be derived from Waiblingen, a small estate belonging to the Hohenstaufen princes. See *Guelfs and Ghibellines.*

Ghiberti (gē-ber'tē), LORENZO, an Italian statuary, born about 1378 at Florence; died about 1455. He early learned from his stepfather, Bartaluccio, an expert goldsmith, the arts of drawing and modeling, and that of

casting metals. He was engaged in painting frescoes at Rimini, in the palace of Pandolfo Malatesta, when the priori of the society of merchants at Florence invited artists to propose models for one of the bronze doors of the baptistry of San Giovanni. The judges selected the works of Donatello and Ghiberti as the best (according to Vasari, also that of Brunelleschi, who is not mentioned by Ghiberti himself as one of the competitors); but the former voluntarily withdrew his claims, giving the preference to Ghiberti. After twenty-one years' labor Ghiberti completed the door, and, at the request of the priori, executed a second, after almost as long a period. Michael Angelo said of these, that they were worthy of adorning the entrance to paradise. During these forty years Ghiberti also completed other works, bas-reliefs, statues, and some excellent paintings on glass, most of which may be seen in the cathedral and the church of Or San Michele at Florence.

Ghika (gē'ka), HELENA, PRINCESS KOLTZOFF-MASSALSKY, better known by the pseudonym of Dora d'Istria, a writer of travels, historical studies, and novels. She was the daughter of Prince Michael Ghika, and niece of Gregory Ghika X, hospodar of Wallachia, and was born at Bukarest in 1828. She was carefully educated, and acquired by frequent travels an extensive knowledge of modern languages and literature. In 1849 she was married to Prince Koltzoff-Massalsky. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published at Paris in 1855. *La Suisse Allemande*, *Les Femmes en Orient*, *Des Femmes par une Femme*, represent social and political studies on modern civilization. In *Au bord des Lacs Helvétiques* (1864) she collected a number of stories written for the *Revue des Deux Mondes*. Amongst her other works are *Eli Albanesi in Rumenia;* and *La Poésie des Ottomans* (1877). She also won distinction as a landscape painter. She died in 1888.

Ghilan (gi-lân'), a province of Persia, on the southwest shore of the Caspian Sea; area, about 4250 square miles. The lofty range of the Elburz Mountains forms its southern boundary. The whole province, except where cleared for cultivation and on the mountain summits, is covered with woods, and the excessive rain and dense vegetation render much of the level country a morass. The climate is consequently unhealthy. The province is rich in metals and very fertile. The capital is Resht. Pop. about 250,000.

Ghirlandaio (gēr-län-dä'yō), or CORRADI DOMENICO, one of the older Florentine painters, born at Florence in 1450; died 1495. He was the son of a goldsmith known as Il Ghirlandaio (the garland-maker), from his skill in making garlands. He was distinguished by fertility of invention, a more natural rendering of life, and a more accurate perspective than his predecessors. Amongst his best works are the frescoes in the Sassetti Chapel of the Trinity Church and in the choir of Santa Maria Novella at Florence, and the pictures in the Uffizi and the academy at Florence. Michael Angelo was one of his pupils.

Ghizeh. See *Gizeh*.

Ghiznevides. See *Ghaznavides*.

Ghizni. See *Ghazni*.

Ghoorkas. See *Goorkhas*.

Ghost Dance, a religious ceremony of the Piute Indians of Nevada, originating about 1889, so-called from the fact that the dancers wore a white shirt over their ordinary dress. It arose from a belief that a Messiah was soon to appear who would drive the white men from the land. It took place at night, the dancers singing the ghost songs, chants in the form of messages from their spirit friends. It quickly spread to other tribes, and led indirectly to the Sioux outbreak of 1890-91.

Ghost-moth, a nocturnal lepidopterous insect (*Hepialus humuli*), so called from the male being of a white color, and from its habit of hovering with a pendulum-like motion in the twilight over one spot (often in churchyards), where the female, which has gray posterior wings and red-spotted anterior wings, is concealed.

Ghur, or GHOR (gar), a mountainous district of Afghanistan, between Herat and Candahar, peopled by Mongol tribes who are practically independent. It was the original seat of the second Mohammedan dynasty in Hindustan, the princes of Ghur, who, in the eleventh and twelfth centuries, included in their kingdom of Ghur, Afghanistan, Lahore, Sind, and Khorasan.

Ghuznee. See *Ghazni*.

Giallo Antico (jäl'ō ăn-tē'kō), the Italian name of a kind of fine yellow marble, used in ancient Roman architecture and obtained from Numidia.

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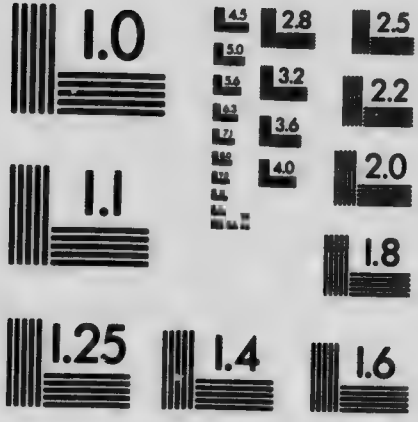

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Gianibelli or GIAMBELLI (jän-i-bel'lē, (jäm-bel'lē), FEDERIGO, an Italian military engineer, born at Mantua about 1530. After having offered his services to Philip II of Spain without much result, he went to England, where Elizabeth gave him a pension and sent him to help the Netherlanders in their defense of Antwerp against the Spaniards (1585). Here he made himself famous by the damage which his inventions did to the enemy. After this he returned to England, where he fortified the coast-line against the Spanish invasion, and suggested the use of fireships, which were so disastrous to the Armada.

Giannone (jän-ō'nā), PIETRO, an Italian author equally celebrated by his fate and by his writings, born in 1676. He studied law in Naples, and after winning a high place as an advocate retired to give himself up to the execution of his great work, the *Civil History of the Kingdom of Naples* (1723). The severity with which Giannone treated the church, and the attacks which he made on the temporal power of the popes, drew upon him the persecutions of the court of Rome, and of the clergy in general. The offensive publication was burned, and the author excommunicated. Giannone therefore quitted Naples, 1723, and took refuge in Vienna, where, for a time, he was protected by the influence of powerful friends, but had ultimately to leave and betake himself to Venice in 1734. Expelled from Venice by the suspicious republic, he finally took refuge in Geneva. Here he wrote his *Triregno*, a bitter attack on the papal pretensions. In 1736, having been enticed by a government emissary to enter the Sardinian States, he was seized and imprisoned in the citadel of Turin, where he died in 1748.

Giant Powder, a name in America for dynamite.

Giants (jī'ants), people of extraordinary stature. History, both sacred and profane, makes mention of giants, and even of races of giants, but this in general occurs only at that early stage of civilization when the national mind is apt to exaggerate anything unusual. Hence the Cyclopes and Læstrygones of the ancients and the Cornish and Welsh giants of English folk-lore. The first mention of giants in the Bible is in Gen., vi, 4, where the Hebrew word used is *nephilim*, a word which occurs in only one other passage, where it is applied to the sons of Anak, who dwelt about Hebron, and who were described by the terrified spies as of such size that compared with them they appeared in their own sight as grasshoppers. A race of giants called the Rephaim is frequently mentioned in the Bible, and in Gen., xiv, and xv, appear as a distinct tribe, of whom Og, king of Bashan, is said to have been the last. Other races of giants are mentioned, such as the Emim, the Zuzim, and the Zamzummim. The giants of old Greek or of Norse mythology have, of course, merely a symbolic existence, representing benignant or adverse forces of nature on which man might count in his struggle to reduce the world around him into some kind of order. The tales of old writers regarding gigantic human skeletons have now no importance, it being mostly certain that these bones do not belong to giants, but to animals of the primitive world which, from ignorance of anatomy, were taken for human bones. The ordinary height of men is between 5 and 6 feet; amongst the Patagonians of South America, however, the average seems to be considerably higher, though not so high as to entitle them to be considered a race of giants. Notable deviations from this medium height are not at all uncommon, especially among the Teutonic peoples. The following are amongst authentic instances, ancient and modern, of persons who attained to the stature of giants: The Roman Emperor Maximin, a Thracian, nearly 9 feet high; Queen Elizabeth's Flemish porter, 7 feet 6 inches; C. Munster, a yeoman of the guard in Hanover, who died in 1676, 8 feet 6 inches high; Cajanus, a Swedish giant, about 9 feet high, exhibited in London in 1742; C. Byrne, who died in 1783, attained the height of 8 feet 4 inches; Patrick Cotter O'Brien, who lived about the same time, was 8 feet 7¾ inches; a Swede in the celebrated grenadier guard of Frederick William I of Prussia stood 8½ feet. In 1844 died Pauline Wedde (called Marian), over 8 feet 2 inches at the age of eighteen. One of the highest on record is the Austrian giant Josef Winkelmaier (1865-1887), whose height was 8 feet 9 inches. As a rule, giants are comparatively feeble in body and mind, and are short-lived. Gigantic stature is generally accompanied by a want of proportion in parts, some parts growing too quickly for others, or continuing to grow after the others have ceased. The relation between the upper and lower half of the body is not disturbed; but the skull, brain, and forehead are relatively small, the jaws very large, the shoulders, breast, and haunches very broad, and the muscular system comparatively weak. Some giants are affected with the disease called acromegaly, an ailment of the pos-

terior half of the pituitary body, a small, ductless gland situated at the base of the brain, in the sella turcica, a saddle-shaped space in the sphenoid bone. In these the hands, head, and feet are especially enlarged.

Giant's Causeway (jī'ants kąz'wā), an extensive and extraordinary assemblage of polygonal basaltic columns on the north coast of Ireland, in the County of Antrim, between Bengore Head and Port Rush. The name is sometimes given to the whole range of basalt cliffs along the coast, some of which reach the height of 400 or 500 feet; but it is more properly restricted to a small portion of it where a platform of closely-arranged basalt columns from 15 to 36 feet in height runs down into the sea in three divisions, known as the Little, the Middle, and the Grand Causeway. The last is from 20 to 30 feet wide, and stretches some 900 feet into the sea. The Giant's Causeway derives its name from the legend that it was built by giants as a road which was to stretch across the sea to Scotland. There are similar formations on the west coast of Scotland, on the island of Staffa.

Giant's Kettles, a name given in Norway to vertical, pot-shaped, smooth hollows excavated in rocks, usually filled up with stones, gravel, etc. They were probably formed by water from the ice of the glacial period, descending through *moulins* or glacial chimneys and setting stones and boulders in rapid rotation. The pot-holes found in the beds of rapid streams and near waterfalls had a similar origin.

Giaour (jour), a Turkish word from Persian *gawr*, an infidel, used by the Turks to designate the adherents of all religions except Mohammedan, more particularly Christians. The use of it is so common that it is often applied without intending an insult.

Giarre (ji-är'rā), a Sicilian town near the coast, in the province of Catania. In the neighborhood are what is left of the famous chestnut trees of Ætna. Pop. 26,194.

Gibbon (gib'un), a name common to the apes of the genus *Hylobătes*, but more particularly restricted to the species *Hylobătes' lar*, which inhabits the islands of the Indian Archipelago. It is distinguished from other quadrumanous animals by the slenderness of its form, but more particularly by the extraordinary length of its arms, which, when the animal is standing, reach nearly to the ankles, and which enables it to swing itself from tree to tree with wonderful agility. Its color is black, but its face is commonly surrounded with a white or gray beard. There are various other species, and the gibbons are classed among the anthropoid apes, and can stand erect with more ease than the orang or gorilla, their long arms aiding them to maintain the erect attitude, though they cannot walk with ease.

Gibbon, Edward, an eminent English historian, was born at Putney in Surrey in 1737. He was the son of a gentleman of an ancient Kentish family. He entered Magdalen College, Oxford, where he remained fourteen months. Having declared himself a Roman Catholic, his father placed him under the care of M. Pavillard, a learned Calvinistic minister at Lausanne, by whom he was reconverted to the Protestant faith. His residence at Lausanne was highly favorable to his progress in knowledge and the formation of regular habits of study. The belles-lettres and the history of the human mind chiefly occupied his attention. In 1758 he returned to England, and immediately began to lay the foundation of a copious library; and soon after composed in the French language his *Essai sur l'Etude de la Littérature* (1761). In 1763 he visited Paris and Lausanne, and he journeyed in Italy during 1764. It was here that the idea of writing his great history occurred to him as he sat musing among the ruins of the capitol at Rome, while the barefooted friars were singing vespers in the Temple of Jupiter. In 1770 he published a pamphlet entitled *Critical Observations on the Sixth Book of the Æneid.* In 1774 he obtained a seat in Parliament for Liskeard, and was a silent supporter of the North administration and its American politics for eight years. In 1776 the first quarto volume of his *Decline and Fall of the Roman Empire* was published, and at once made a public reputation for its author. In 1778 he drew up on behalf of the English government a *Mémoire Justificatif* in answer to the manifesto of the French court, and for this service he was made one of the lords of trade. On the retirement of North he lost his appointment, and soon after withdrew to Lausanne (1783), where, in the course of four years, he completed the three remaining volumes of his history, which were published together in 1788. In 1793 he returned to England, where he died in 1794.

Gibbon, John, soldier, born in Pennsylvania in 1828. He graduated at West Point in 1847, became captain in 1859; took part in the Civil war, commanding a brigade at Antietam and

Gettysburg, and serving as major-general in Grant's Wilderness-Richmond campaign. He was breveted major-general in the regular army in 1865, promoted brigadier-general in 1886, retired in 1891, and died in 1896.

Gibbons, James, a cardinal of the Roman Catholic Church, was born at Baltimore in 1834. He was ordained a priest in 1861; made bishop of North Carolina in 1868, and of Richmond in 1872; archbishop of Baltimore in 1877, and created cardinal in 1886. As an author he is best known by *The Faith of Our Fathers.*

Gibbons, Orlando, an English musical composer, born in 1583; died in 1625. At the age of twenty-one he was appointed organist of the Chapel Royal, and in 1622 he received the degree of Doctor of Music from the University of Oxford. Three years later he died of smallpox at Canterbury, where he had gone to be present at the marriage of Charles I with Henrietta of France. He was buried in Canterbury Cathedral, where his wife caused a magnificent tomb to be erected to him. He is the author of *Madrigals and Anthems* ('Hosanna to the Son of David!' 'Almighty and Everlasting God!' etc.).

Gibbs, Oliver Wolcott, an American chemist (1822-1908), born in New York City. He was professor of physics and chemistry in the College of the City of New York, 1849-63, and Rumford professor of chemistry in Harvard University, 1863-87. He was one of the contributing editors of the *American Journal of Science.* His chemical researches in analytical and inorganic chemistry were of great value. The Wolcott Gibbs Laboratory at Harvard is named for him.

Gibel (jib'el), a fish of the carp genus, *Cyprinus gibelio,* generally known in England as the Prussian carp, and belonging to that section of the genus having no barbules at the mouth. It is a good table fish, but seldom weighs more than ½ lb. It is said to be able to live so much as thirty hours out of water.

Gibeon (ghib'e-on), one of the ancient royal cities of the Canaanites, a 'great city' of the Hivites, who at an early stage of Joshua's conquests, by disguising themselves in old clothes and professing to come from a far country, obtained an alliance and covenant with the Israelites. When the stratagem was discovered, the Israelites resolved to observe the covenant, but condemned them to be 'hewers of wood and drawers of water unto all the congregation' (Jos., ix, 21). It was during the battle here between Joshua and the five kings of the Amorites that the sun 'stood still upon Gibeon, and the moon in the valley of Ajalon.' Gibeon has been identified with the modern El-Jib.

Gibraltar (jib-ral'tar), a town and strongly-fortified rocky peninsula near the southern extremity of Spain, a military stronghold of Great Britain. It is connected with the mainland by a low, sandy isthmus, 1½ miles long and ¾ mile broad, known as the 'neutral ground,' and has Gibraltar Bay on the west, the open sea on the east and south. The highest point of the rock is about 1400 feet above sea-level; its north face is almost perpendicular, while its east side exhibits tremendous precipices. On its south side it is almost inaccessible, making approach from seaward impossible; the west side, again, although very rugged and precipitous, slopes towards the sea; and here the rock is secured by extensive and powerful batteries, rendering it apparently impregnable. Vast sums of money and an immense amount of labor have been spent in fortifying this celebrated stronghold, which, as a coaling station, depôt for war material, and a port of refuge in case of war, would form one of the most important points of support for British naval operations and British commerce eastwards. Numerous caverns and galleries, extending 2 to 3 miles in length, and of sufficient width for carriages, have been cut in the solid rock, with port-holes at intervals of every 12 yards bearing upon the neutral ground and the bay, and mounted with more than 1000 guns, some of them of the largest size. The garrison numbers about 5000. The town of Gibraltar is situated on the west side of the peninsula, terminating in Europa Point, and thus fronts the bay. It consists chiefly of one spacious street about ½ mile in length, lined with shops, and paved and lighted. Its water supply is derived from the rainfall. Gibraltar is a free port, and has a considerable shipping trade, being an entrepôt for the distribution of British manufactures. The chief export is wine. The civil population amounts to about 22,000.

—Gibraltar, known to the Greeks as Calpe, was first fortified as a strategic point by the Saracen leader Tarik Ibn Zeiad in 711-12, from whom it was thenceforward called Gebel-al-Tarik, the rock of Tarik. It was ultimately taken by the Spaniards from the Moors in 1462, fortified in the European style, and so much strengthened that the engineers of the seventeenth century considered it impregnable. It was taken, however, after a vigorous bombardment in 1704

by a combined English and Dutch force under Sir George Rooke and Prince George of Darmstadt, and was secured to Britain by the Peace of Utrecht in 1713. Since then it has remained in British hands, notwithstanding some desperate efforts on the part of Spain and France to retake it. In 1704-5 it was closely besieged; in 1727 it was hard pressed by a Spanish force when Admiral Wager, with eleven ships of the line, relieved it. In 1779, Britain being then engaged in a war with its revolted colonies and with France, a last grand effort was made by Spain to recover Gibraltar. The siege lasted for nearly four years, the fire being for the great part of that time very harassing, and rising on several occasions into a fierce and prolonged bombardment. It was heroically and successfully defended, however, by General Elliot (afterwards Lord Heathfield) and the garrison. Since that time, in the various British and Spanish, and also French wars, Gibraltar has only been blockaded on the land side.

Gibraltar, STRAITS OF, the channel which forms an entrance from the Atlantic into the Mediterranean. The narrowest part is a little to the west of Gibraltar, and 15 miles across. A strong and constant current flows into the Mediterranean from the Atlantic Ocean, in the middle of the Straits, but the undercurrent as well as two feeble lateral currents along the coast set towards the ocean.

Gibson (gib'son), CHARLES DANA, artist, born at Roxbury, Massachusetts, in 1867. He studied art in New York and Paris, and became a successful instructor and society cartoonist in New York. The 'Gibson girl' an American type, was created by him. He wrote *People of Dickens, Sketches and Cartoons, A Widow and her Friends, The Social Ladder*, etc.

Gibson, JOHN, one of the most distinguished English sculptors of modern times, born near Conway, in Wales, in 1790; died at Rome in 1866. He was the son of a landscape-gardener, and was apprenticed to a woodcarver at Liverpool, where he attracted attention by a figure of *Time* modeled in wax which he exhibited at the age of eighteen. The patronage of Mr. W. Roscoe assisted him to go to Rome, where he was cordially received by Canova. On the death of Canova in 1822, Gibson entered the studio of Thorwaldsen. His reputation was now widely spread, and his works were eagerly sought after by his countrymen. In 1836 he was made a Royal Academician; but to the end of his life he continued to make Rome his chief place of residence. Most of Gibson's subjects are taken from classical mythology, and are executed with a noble severity and purity of style. Among his best works are: *The Wounded Amazon; The Hunter and His Dog; Hylas and the Nymphs, Helen, Proserpine, Sappho*, and others. One of his peculiarities as an artist was the practice of coloring his statues.

Giddings (gid'ings), FRANKLIN HENRY, sociologist, born at Sherman, Connecticut, in 1855. He engaged in journalism and afterwards became a professor of and lecturer in sociology. Has held this chair in Columbia University since 1894. He wrote *The Theory of Sociology, The Principles of Sociology*, and other works on this subject.

Giddings, JOSHUA REED, statesman, was born at Athens, Pennsylvania, 1795: died in 1864. Successfully practicing as a lawyer, in 1839, he was elected to congress, serving for twenty years. An advocate of the abolition of slavery in the territories, he seized every opportunity to aid in the formation of a public sentiment hostile to its further extension. His life was often threatened, and twice he was assaulted by armed men on the floor of the House, and once mobbed in Washington. For antislavery resolutions introduced by him he was censured by vote of the House. He was a forcible speaker and able writer.

Giers (gērz), NICHOLAS CARLOVITCH DE, a Russian statesman descended from a Swedish family settled in Finland, was born in 1820. After holding various posts, in 1875 he became adjunct to Prince Gortschakoff, the minister of foreign affairs, whom he succeeded in 1882. His policy in general was understood to be of peaceful tendencies, and in particular opposed to Panslavistic ideas of development. In Central Asia, however, he continued the policy of advance, and in 1885 the Russian occupation of positions within the Afghan frontier nearly brought about a war with Britain. He died in 1895.

Giessen (gē'sĕn), a town of Germany, capital of the province of Upper Hesse, in the Grand-duchy of Hesse-Darmstadt, on the Lahn. It was once fortified, and is still entered by four gates, but its ramparts have been converted into pleasant walks. It has a castle, now converted into government offices, and a university founded in 1607, and possessing valuable apparatus, an observatory, and a botanical garden. Pop. 31,153.

Gifford (gif'ord), ROBERT SWAIN, artist, born at Goswald, Massachusetts, in 1840, the son of a poor boatman. He traveled extensively in the interest of art and became one of the leading American landscape painters, and was also distinguished as an etcher and art instructor. He died in 1905.

Gifford, SANDFORD ROBINSON, painter, born at Greenfield, New York, in 1823; died in 1880. He developed a versatile talent as an artist, his main attention being given to landscapes. Among his noted works are *Coming Storm*, *Waves Breaking on the Beach*, and *Morning in the Mountains*.

Gifford, WILLIAM, a critic and satirist, born at Ashburton, Devonshire, in 1757. He was apprenticed to a shoemaker, but possessing a strong taste for study he was enabled by the kindness of some friends to go to school and afterwards to Oxford University. After being some time tutor in Earl Grosvenor's family he published in 1794, *The Bæviad*, a satire directed against the poetasters of the Della Crusca school; and in 1795 *The Mæviad*, a severe satire on the contemporary drama. In 1797 he became editor of the *Anti-Jacobin;* and he published a translation of Juvenal in 1802. On the foundation of the *Quarterly Review* in 1809, he became its editor, conducting it with much ability. He also edited the works of Massinger, Ford, Jonson, and Shirley. He died in 1826, and was interred in Westminster Abbey.

Gifford Lectures, lectureships endowed by Lord Gifford, one of the judges of the Court of Session, Edinburgh, from 1870 to 1881, who left £80,000 for the purpose. They were founded in connection with the Universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews, and are for the exposition of natural religion in the widest sense of that term; the lecturers to be subjected to no test of any kind; to belong to any denomination whatever, or to no denomination. The appointments are for two years, but may be held for six. The lecturers were to deliver a yearly course of about twenty original lectures open to all. The first lecturers were: Glasgow, Max Müller; Edinburgh, Hutchinson Stirling; St. Andrews, Andrew Lang; and Aberdeen, E. B. Tylor.

Gijon (hē-hōn'), a seaport in Spain, on the Bay of Biscay. It consists of an old and a new town, the former on the upper part of a slope and the latter below. It contains a cigar manufactory, employing about 1400 persons, and has various other industries and a good trade. Pop. 52,226.

Gila (hē'lä), RIO, a North American river, which rises in New Mexico and flows westward for 450 miles, and then unites with the Colorado. Curious ruins of stone-built houses occur all along its banks. In these are found fragments of pottery.

Gila Monster (*Heloderma suspectum*), a poisonous lizard of the desert region of the Southwest United States. It is one of the largest lizards of the continent, and has scales of brilliant orange and jet black. Its bite is fatal to small mammals and birds and very injurious to man, though seldom fatal. *H. horridum*, of Mexico, is similarly poisonous.

Gilbert (gil'bert), SIR HUMPHREY, an English navigator of the reign of Queen Elizabeth, born in Devonshire about 1539. In 1578 he obtained from the queen a patent, empowering him to discover and colonize in North America any land then unsettled, and made an unsuccessful voyage to Newfoundland. In 1583 he sailed to it again, and took possession of the harbor of St. John's. On his return home he embarked in a small vessel and was lost in a storm.

Gilbert, SIR JOHN, an English painter, born in 1817. He first exhibited in 1836. His first notable work was *The Arrest of Lord Hastings by the Protector Richard, Duke of Gloucester*, in water-color. He has also painted in oil, and among his more notable productions in that branch of the art are *Don Quixote giving Advice to Sancho Panza*, *The Education of Gil Blas*, and a series of tableaux of the principal character in Shakespere. He possessed especial merit in depicting old English scenes. He was the most prominent artist engaged on the *Illustrated London News* for a number of years after its commencement in 1842, and during the same period did a great amount of book illustration. In 1871 he became president of the Society of Water-Colors. In the same year he was knighted, and in 1872 he became an A.R.A., becoming R.A. in 1876. He died in 1897.

Gilbert, JOHN GIBBS, actor, born at Boston, Massachusetts, in 1810; died in 1897. After acting four years in the United States and England, he joined Wallack's company in New York in 1862. He was highly popular in old men characters, such as *Sir Peter Teazle*, *Sir Anthony Absolute*, *Old Dornton*, etc.

Gilbert, JOHN S., naval architect, was born in Connecticut in 1801; died in 1891. He invented the balance drydock now used at all im-

portant seaports, and built some of the largest drydocks in the United States. For several years he was in the service of the Austrian government, and declined tempting offers from Russia on account of age.

Gilbert, WILLIAM SCHWENK, an English dramatist, born in London in 1836. In 1857 he became a clerk in the Education Office, and in 1862 was called to the bar, but has devoted his time since then almost exclusively to literature. In 1875 he entered into partnership with Arthur Sullivan, the composer, and in conjunction with him produced a series of comic operas, *Trial by Jury* (1876), *Pinafore* (1878), *The Pirates of Penzance* (1880), *Patience* (1882), *Iolanthe* (1883), *Princess Ida* (1884), *The Mikado* (1885), etc. Died by drowning, May 29, 1911.

Gilbertine Order (gil'ber-tēn), an order of canons founded in England by Gilbert of Sempringham in the twelfth century. They followed the Augustinian rule, and their numerous monasteries were suppressed by Henry VIII. There was also a Gilbertine order of nuns.

Gilbert Islands, or KINGSMILL GROUP, a group of sixteen islands in the Pacific Ocean, on the equator, between lon. 172° 0′ and 174° 30′ E. Area about 170 sq. miles. They are of coral formation, and all low and not fertile. Their chief products are mostly the cocoanut, pandanus, taro, and the breadfruit tree. The islanders differ from the Polynesians, and more nearly resemble the Malays. The women are much smaller in proportion than the men, with delicate features and slight figures. Pop. of the group 40,000, of whom a certain number are Christians. They were annexed by the British government in 1892.

Gilberton, a borough in Schuylkill County, Pennsylvania, 4 miles from Mahanoy City; a mining town and the railroad center for all coal mined in the Mahanoy and Shenandoah Valleys. Pop. 5401.

Gilboa (gil-bō'a; Hebrew, 'Bubbling Fountain'), a range of hills in Palestine, bounding the plain of Esdraëlon on the N. E. One of them is identified with the ancient Gilboa, the scene of Saul's last fatal battle (I Sam., xxix, 1).

Gildas (gil'das) THE WISE (SAPIENS), a British ecclesiastic and historian of the sixth century, of whom little is known. There is extant a Latin treatise or diatribe ascribed to Gildas which bears the title of *Epistola de Excidio Britanniæ* ('On the Destruction of Britain'), but the violent invective which it employs against the Britons has led to doubts respecting its authenticity.

Gilder (gil'der), RICHARD WATSON, editor and author, born at Bordentown, New Jersey, in 1844. He engaged in railroad work, established the *Newark Register*, in 1870 became managing editor of *Scribner's Magazine*, and in 1881 editor-in-chief of *The Century*. He published *Five Books of Song*, *For the Country*, *In Palestine and Other Poems*, etc. He died in 1909.

Gilder, WILLIAM HENRY, Arctic explorer, brother of the preceding, was born at Philadelphia in 1838, died in 1900. He took part in the Franklin Search Expedition of 1878-80, and the De Long Arctic Expedition of 1881. After the disaster to the latter he made a winter journey of two thousand miles through Siberia to the nearest telegraph station, and took part in the search in the Lena delta for De Long and his companions. He wrote *Schwatka's Search* and *Ice Pack and Tundra*.

Gilding (gild'ing) is the art of applying gold-leaf or gold in a finely-divided state to surfaces of wood, stone, or metals, a very ancient art, it having been practiced among the Egyptians, Greeks, Romans, and ancient Persians. The processes employed at the present day are very varied. Metals are gilded either by what is called chemical gilding, mercurial gilding, electrogilding (see *Electrometallurgy*), or by the application of gold-leaf. Copper and brass, for instance, may be gilded by the process called *wash* or *water gilding*, with an amalgam of gold and mercury. The surface of the copper, freed from oxide, is covered with the amalgam, and afterwards exposed to heat till the mercury is driven off, leaving a thin coat of gold. Gilding is also performed by dipping a linen rag in a saturated solution of gold, and burning it to tinder, the black powder thus obtained being rubbed on the metal to be gilded, with a cork dipped in salt water, till the gilding appears. Iron or steel is often gilded by applying gold-leaf, after the surface has been well cleaned, and heated until it has acquired the blue color which at a certain temperature it assumes. Several leaves of gold are thus applied in succession, and the last is burnished down cold. One process of chemical gilding is by dipping the article into a solution of gold, what is termed Elkington's solution being composed as follows:—6 oz. (troy) of fine gold; nitrohydrochloric acid, 52 oz. (avoir-

dupois); dissolve by heat, and continue the heat until the cessation of red or yellow vapors; decant the clear liquid; add 4 gals. of distilled water, pure bicarbonate of potassium 20 lbs., and boil for two hours. Gilding on wood, plaster, leather, parchment, or paper is performed by different processes of mechanical gilding. The first of these is oil-gilding, in which gold-leaf is cemented to the work by means of oil-size. In the case of paper or vellum the parts to be gilt receive a coat of gum-water or fine size, and the gold-leaf is applied before the parts are dry. They are afterwards burnished with agate. Lettering and other gilding on bound books are applied without size. The gold-leaf is laid on the leather and imprinted with hot brass types. Brass rollers with thin edges are employed in the same way for lines, and similar tools for other ornaments. When the edges of the leaves of books are to be gilt they are first cut smooth in the press, after which a solution of isinglass in spirits is laid on, and the gold-leaf is applied when the edges are in a proper state of dryness. Japaner's gilding is another kind of mechanical gilding, which is performed in the same way as oil-gilding, except that instead of gold-leaf a gold dust or powder is employed. Frames of pictures and mirrors, moldings, etc., are gilt by the application of gold-leaf, or by the cheaper process of 'German gilding,' that is, by tin-foil or silver-leaf, with a yellow varnish above. Porcelain and other kinds of earthenware, as well as glass, may be gilt by fixing a layer of gold in a powdered state by the action of fire. The gold-dust or powder required in this operation may be obtained by precipitating it from a solution in aqua regia, either by means of sulphate of iron or protonitrate of mercury. In order that the gold powder may be applied to the surface of the article to be gilt it must be well mixed with some viscous vehicle, such as strongly-gummed water. It is then laid on with a fine camel-hair brush.

Gilead (gil'ē-ud), a mountain region on the east of Palestine, having Bashan on the north and Moab and Ammon on the south. It was noted for its balm, as well as for its pasturage.

Giles (jīlz), St. (*St. Ægidius*), a native of Greece, who, according to the legend, lived in the sixth century, and was descended from an illustrious family. He is said to have worked miracles, and founded a convent in France. He became patron saint of Edinburgh. His festival falls on the 1st of September.

Giles, St., name of a parish in London, with which is incorporated that of St. George, Bloomsbury, both in the borough of Finsbury. The wretchedness of St. Giles is often contrasted with the luxury of St. James in London.

Gilfillan (gil-fil'an), George, a British author, born in 1813; died in 1878. He became a licentiate of the Secession (Presbyterian) Church, and in 1836 was ordained to the School Wynd Church, Dundee. His numerous writings, among which may be mentioned *A Gallery of Literary Portraits*, and *The Bards of the Bible*, possess a vigorous style and great powers of fancy.

Gilfillan, Robert, a Scottish poet, born in Dunfermline in 1798; died in 1850. He learned to be a cooper, and after trying one or two other trades he was latterly collector of police rates in Leith. In 1831 he published a small volume entitled *Original Songs*.

Gilghit, or Gilgit (gil'git), a valley and district in Cashmere, situated on the southern slope of the Hindu Kūsh, and watered by the Gilgit, or Yasm, a tributary of the Indus.

Gill (jil), a measure of capacity equal to ¼ of a pint, and $\frac{1}{32}$ of a gallon.

Gill (gil), David, astronomer, born in Aberdeenshire in 1843. He became in 1879 royal astronomer at the Cape of Good Hope. He organised expeditions to observe two transits of Venus, and in 1885 began a photographic survey of the southern heavens, making a catalogue in 1895 of 450,000 stars. His publications have been valuable and numerous.

Gill, Theodore Nicholas, ichthyologist, born in New York in 1837. After many years' connection with the Smithsonian Institution, he became professor of zoology at Columbian University, now George Washington University, in 1884. He has published numerous papers on fishes and has given attention to other departments of zoology.

Gilles (zhēl), St., a town in Southern France, dep. Gard, a country rich in vineyards. Pop. 6381.

Gillette (gil'let), William Hooker, actor and dramatist, was born at Hartford, Connecticut, in 1857. He began a stage career in 1877, and after 1881 played in his own dramas. These include *The Professor*, *Held by the Enemy*, *Secret Service*, *Sherlock Holmes*, etc.

Gillies (gil'is), John, a Scottish historian and scholar, born at Brechin in 1747; died at Clapham in

1836. He settled in London, where he applied himself to literature. He wrote a *History of Ancient Greece* and a *View of the Reign of Frederick II*, and translated a number of Greek works.

Gillray (gil-rā), JAMES, an English caricaturist, born about the middle of the eighteenth century; died in London in 1815. He caricatured the king (George III) and the members of the House of Lords and afterwards the French and the French celebrities of the day.

Gills (gils), the respiratory organs of animals which respire by obtaining oxygen from water, as crustaceans, molluscs, fishes and amphibians. In fishes they consist of cartilaginous or bony arches attached to the bones of the head, and furnished on the exterior convex side with a multitude of fleshy leaves or fringed vascular fibrils resembling plumes. The water is admitted by the gill-opening, and acts upon the blood as it circulates in the fibrils.

Gillyflower (jil'i-flou-ėr), a name bestowed on such cruciferous flowers as the wallflower or carnation, etc. The clove-pink (*Dianthus Caryophyllus*) is termed clove gillyflower.

Gilman, CHARLOTTE PERKINS, an American author and lecturer, born at Hartford, Connecticut, July 3, 1860. Her books include *Women and Economics* (1898), *Concerning Children* (1900), *The Home, Its work and Influence* (1903), *The Man-Made World* (1910).

Gilman, DANIEL COIT, educator, born at Norwich, Connecticut, in 1831; died in 1908. He graduated at Yale in 1852, and was professor of geography there 1856-72; president of the University of California 1872-75. Elected the first president of Johns Hopkins University in 1875, he served there till 1901, and in 1902 was elected president of the Carnegie Institution. He was a member of the Venezuela boundary-line commission of 1896-97.

Gilmore, JAMES ROBERTS, author, born at Boston in 1832; died in 1903. He wrote, under the pen-name of Edmund Kirke, several novels of Southern life during the Civil war, and also wrote a number of historical works, including *The Rear-Guard of the Revolution*, *John Sevier as a Commonwealth Builder*, etc.

Gilolo, JILOLO (jē-lō'lō), an island in the Indian Archipelago, the largest of the Moluccas; area, 6500 square miles. It is of singular form, consisting of four peninsulas, radiating N., N. E., E. S. E., and S., from a common center, and having large bays between. It is rugged and mountainous, the mountains being volcanic. The principal productions are sago, cocoanuts, spices, edible birds'-nests, useful timber, etc.; horses, cattle, and sheep abound. Deer, wild boars, and other game are likewise plentiful. The original inhabitants, called Alfoories, have been gradually pressed into the interior by the Malays. The island is under Dutch rule and has a population of about 120,000.

Gil Polo. See *Polo.*

Gilthead (gilt'hed; *Chrysophrys aurata*), an acanthopterygious fish of the Sparidæ or sea-bream family common in the Mediterranean. It has strong grinding teeth for crushing the shells of the molluscs on which it feeds; a yellow band stretches from eye to eye (whence its generic name, signifying 'golden eyebrows'). Its color is a mixture of silver and sky-blue, its dorsal and caudal fins are black, while brown lines pass along the sides. It is a fine fish, and sometimes reaches a weight of 18 to 20 lbs.

Gilt Toys, the trade term for trinkets of copper or German-silver, with a thin coating of gold or silver spread over its surface. Gilt toys are thus cheaper than gold and silver jewelry, but they may be equally brilliant and as little liable to tarnish. In Britain this industry is chiefly carried on at Birmingham; and in France at Paris and Lyons.

Gimbals (gim'balz), the name of the pair of rings within which the mariner's compass is slung, or any pair of similar rings. The gimbals maintain the compass-bowl and the compass-card in a horizontal position, there being two concentric rings, the outer turning about a horizontal axis, and the inner turning about a similar axis at right angles to the other. Ship chronometers are often suspended the same way.

Gimlet (gim'let), a small tool with a pointed screw at the end, used for boring holes in wood or other substances by turning. A larger instrument of this nature is termed an *auger*.

Gimp (gimp), a silk, woolen, or cotton twist stiffened by a fine wire, or sometimes a coarse thread running through it, and much used in trimmings for dresses, etc.

Gin (jin), a spirit distilled from grain, and flavored with juniper-berries, and sometimes with oil of turpentine and common salt, and with other substances. The name is from *genièvre*, the French for 'juniper.' It is largely

manufactured in Holland, particularly in Schiedam, and the gin thence imported is thus often called Schiedam as well as Hollands. In Great Britain gin is largely manufactured in London, where it often goes by the name of *Old Tom*, and to a less extent at Plymouth and Bristol. What is termed 'gin' in Great Britain differs materially from Hollands and even from the best English gin, as it is a plain corn spirit, which derives its flavor from oil of turpentine, with certain aromatics in small quantities.

Gin, the name of certain machines employed in raising weights. One form consists of three poles, 12 to 15 feet long, often tapering from the lower extremity to the top and united at their upper extremities, whence a block and tackle is suspended. A space of 8 or 9 ft. separates the lower extremities planted in the ground, and a kind of windlass is attached to two of the legs. Another kind of gin is a sort of whim or windlass for raising coal, etc. It is worked by a horse, which turns a cylinder, and winds on it a rope, by which the weight is raised. See *Cotton Gin*.

Gingal (jin'gal), a kind of large musket used in some parts of Asia. It is fired from a rest, and may be mounted on a light carriage.

Gingelly Oil (jin-jel'i). See *Benné Oil*.

Ginger (jin'ger; *Zingiber officindle*), an East Indian plant of the order Zingiberaceæ. It grows in moist places in various parts of tropical Asia and the Asiatic islands, and has been introduced into the West Indies, particularly Jamaica, as also into S. America and W. Africa. The kind most esteemed is Jamaica ginger. The rhizome, or underground stem, is what is used, being employed in various ways. It has an aromatic, pungent taste, and when young is candied, and makes an excellent preserve. It is a favorite condiment and is used medicinally as a carminative, stomachic, and in indigestion. It enters into the composition of a great number of confections, infusions, pills, etc. The special preparations are the *tincture* and the *essence* of ginger, and the *syrup*, prepared by mixing twenty-five parts of syrup with one of the strong tincture. *Infusion* of ginger is a preparation useful for flatulence.

Ginger Plant (*Zingiber officinale*).

Ginger-ale, an aërated water made in the same way as lemonade, but flavored with ginger instead of lemon.

Ginger-beer, a pleasant, non-alcoholic, effervescing beverage, made by mixing together ginger, cream of tartar, sugar, yeast, and water, and allowing the whole to ferment for a time, then bottling. Ginger-beer may also be prepared thus: Add to each gallon of water 1 lb. of refined sugar, and ½ oz. of ground ginger. Boil for an hour, add the white of two eggs, remove the scum. Strain into a vessel to cool, cask it up with the juice and peel of a lemon. Add a very small amount of brewer's yeast, and bung up tightly for a fortnight.

Gingerbread, a well-known cake made in many ways, the chief ingredients being flour and treacle, with butter, eggs, etc., and enough ginger to flavor it.

Ginger-cordial, or GINGER-WINE, a beverage made from raisins, lemon rind, ginger, sugar, and water, with some whisky or brandy.

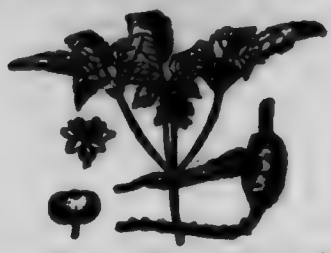
Gingham (ging'am), a cotton fabric distinguished from calico by having the colors woven with the fabric, not printed on it. The patterns are various; sometimes fancy designs, sometimes checkered, and sometimes striped. Umbrella ginghams are all of one color.

Gingko (ging'kō), the Japanese name of coniferous trees of the genus *Salisburia* belonging to the yew family. The *Salisburia adiantifolia* is a tree which sometimes rises nearly 100 feet in height. It is destitute of resin. It is a native of China and Japan, and was introduced into Europe in 1754, when it was brought to England. Its fruit encloses a kernel which, when roasted, may be used as food, and which tastes like maize.

Ginsburg (gins'bürh), CHRISTIAN, a rabbinical scholar, born at Warsaw in 1830. He is the author of *Historical and Critical Commentary on the Song of Songs; The Karaites, their History and Literature; The Essenes; The Kabbalah, its Doctrines, Development, and Literature*, and other works of similar character. His greatest work is, however, the *Massora*. He was one of the scholars engaged on the revised version of the Old Testament.

Ginseng (jin'seng), a plant of Northern Asia, *Panax schinseng*, order Araliaceæ, herbaceous,

and about 1 foot high. Its root is regarded as a sort of panacea among the Chinese, and is largely imported, but it appears to be really of very little efficacy; the taste is sweet and mucilaginous, accompanied with some bitterness, and also slightly aromatic. Another species of



American Ginseng (*Panax quinquefolium*).

ginseng, *Panax quinquefolium*, inhabits Canada and the northeastern parts of the United States. Quantities of its root are sent to China.

Gioberti (jō-bĕr'tē), Vincenzo, an Italian philosopher and statesman, born at Turin in 1801; died at Paris in 1852. Having been educated for the church, he was appointed chaplain to Charles Albert, King of Sardinia, but rendered himself obnoxious by his republican sentiments, and was first imprisoned, and, in 1833, banished. The first few years of his exile he spent at Paris, and afterwards became a teacher of philosophy in a school at Brussels. There he published two works, one of which was an attempt to reconcile philosophy and Roman Catholicism. In 1843 appeared his *Primato Morale e Civile degli Italiani*, a defence on liberal principles of the papacy, a work which brought over the majority of the priests to the national party. In 1847 he published a work entitled *Il Gesuita Moderno* ('The Modern Jesuit'). When Charles Albert in 1848 granted a constitution to Sardinia, Gioberti returned to his native country, but he soon after withdrew to Paris.

Giobertine Tincture (jō-bĕr'tin), a preparation for restoring illegible writings or faded pictures. The inventor of it was Giovanni Antonio Gioberti (1761-1824), a native of Piedmont.

Gioja Del Colle (jō'yȧ del kol'lȧ), a town in Southern Italy, province of Bari, on a slope of the Apennines. Pop. 21,721.

Giordano (jor-dā'nō), Luca, an Italian painter, born at Naples about 1632, a scholar of Spagnoletto, studied the great Italian masters at Rome, and became the pupil of Peter of Cortona. Paul Veronese had afterwards great influence on his manner. He imitated the greatest masters so well that even connoisseurs were imposed upon. In 1679 he was employed by Charles II to ornament the Escurial, and at the court of Spain he became a great favorite. Giordano was especially successful in imitating the manner of Bassano, and of the Chevalier Massimo Stanzioni. After the death of Charles II he returned to his native country, where he died about 1705. His most celebrated pieces are his frescoes, in the Escurial, at Madrid, Florence, and Rome. Some of his finest paintings are at Dresden.

Giorgione (jor-jō'nā), properly Giorgio Barbarelli, born in 1477 at Castelfranco, one of the most celebrated painters of the Venetian school. In Venice he ornamented the façades of several large buildings with frescoes, which have mostly perished. He found in Titian a formidable rival in this branch of his art. His portraits are reckoned among the finest of the Italian school. His pieces are rare, but some are to be seen at Milan, and in the galleries at Vienna and Dresden. He died in 1511.

Giotto (jot'tō), properly Ambrogiotto or Angiolotto Bondone, a celebrated Italian painter. He was born probably about 1276, at the Florentine village of Vespignano, and in his boyhood tended cattle. But having been seen by Cimabue, as he was drawing figures of his sheep upon a piece of slate, that artist carried him to Florence and taught him painting. His natural talent and gracefulness developed so rapidly that he soon surpassed all his contemporaries. He represented human figures with truth and nature, and surpassed all others in the dignity and pleasing arrangement of his figures, and a regard to the proportions and disposition of the drapery. His figures have more life and freedom than those of Cimabue, as he particularly avoided the stiff style. Among his most celebrated pieces is the *Navicella* (ship), at Rome (a picture of 'Peter Walking Upon the Waves'), some fresco paintings at Florence, also the history of St. Francis, at Assisi, and several miniatures. He was equally successful as a statuary and as an architect. He died in 1336.

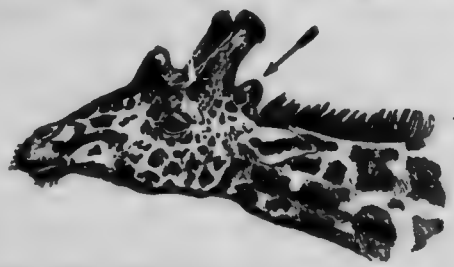
Giovinazzo (jō-vē-nät'sō), a seaport of South Italy, province of Bari, on the Adriatic, the seat of a bishop. Pop. 11,617.

Gipsy. See *Gypsies*.

Giraffe (ji-raf'; *Camelopardalis giraffa*), a ruminant animal inhabiting Africa, and constituting the only species of its genus and family. It is the tallest of all animals, a full-grown male reaching the height of 18 or 20 feet.

Giraffe (*Camelopardalis giraffa*)

This great stature is mainly due to the extraordinary length of the neck, in which, however, there are but seven vertebræ, though these are extremely elongated. It has two bony excrescences on its head resembling horns. Its great height is admirably suited with its habit of feeding on the leaves of trees, and in this the animal is further aided by its tongue, which is both prehensile and capable of being remarkably elongated or



Five-Horned Giraffe, showing Missen Horns.

contracted at will. When it browses the herbage on the ground it stretches out its forelegs as wide as possible till it can reach the ground by means of its long neck. Its color is usually light fawn, marked with darker spots. It is a mild and inoffensive animal, and in captivity is very gentle and playful. The giraffe is a native of a great part of Africa, from Abyssinia and Sennar to Senegal and the regions adjacent to the Cape Colony.

Giraldus Cambrensis (je-ral'dus kam-bren'sis), an early English historian, born about 1146. His proper name was Gerald de Barry, and he was son of William de Barry, a Norman noble of Pembrokeshire. He was educated under his uncle, the Bishop of St. David's, and afterwards at the University of Paris. He returned in 1172, and was appointed archdeacon of St. David's. His uncle dying soon after, Gerald was elected to succeed him, but the king refused to confirm the appointment, and Gerald withdrew to Paris, where he was appointed professor of canon law. In the following year (1180) he returned to England, where he was required to administer the bishopric of St. David's, the proper bishop having proved himself incompetent. He discharged this office for four years, and was then appointed a royal chaplain. As companion to the king's son, Prince John, he went to Ireland in 1185, where he collected the materials for his Topography of Ireland (*Topographia Hiberniæ*). He afterwards drew up a similar work on Wales (*Itinerarium Cambriæ*). When he died is uncertain.

Girard (ji-rard'), STEPHEN, plutocrat and philanthropist, was born near Bordeaux, France, in 1750. In 1769 he established himself in business in Philadelphia, and in 1782 laid the foundation of a great fortune in the West India trade. In the war of 1812 he was the financial mainstay of the United States government, at one time advancing $5,000,000. At his death, in 1831, his property amounted to $9,000,000, a sum considered very large at that time, and the bulk of which was left for charitable purposes. The celebrated Girard College, at Philadelphia, was founded by him, costing $2,000,000, an institution for the education of orphan boys, between the ages of six and fourteen. It has proved one of the most successful and useful of charitable institutions.

Girardin (zhē-rär-dan), EMILE DE, a French journalist and politician, born in Switzerland in 1802, and educated in Paris. He was connected as projector, editor, or otherwise with a number of newspapers and periodicals, the most successful being *La Presse*, a Conservative organ established in 1836. A controversy in its columns led to a duel between Girardin and Armand Carrel,

which proved fatal to the latter. In politics Girardin played many parts. He was fined 5000 francs in 1857 for attacks on the imperial government in *La Liberté*. He wrote numerous political pamphlets, and a few pieces for the stage. He died in 1881.—His first wife, Delphine Gay, daughter of the novelist Madame Sophie Gay, was a well-known authoress; born 1804; died 1855. She wrote the novels *Le Lorgnon*, *Le Marquis de Pontanges*, *La Canne de M. de Balzac*, *Il ne faut pas jouer avec Douleur*, and *Marguerite*; contributed to the *Presse* newspaper, and wrote for the stage *Lady Tartuffe* and *La Joie fait peur*, and other pieces.

Girasol (jĭ'ra-sŏl), a precious opaline stone, which, under strong lights, reflects a brilliant reddish light. It is usually of a milk-white or bluish-white color. The brightest are brought from Brazil and Siberia. The name is sometimes bestowed on the Asteria sapphire. One variety is known as the fine opal.

Girder (gir'dẽr), a main beam, either of wood or iron, resting upon a wall or pier at each end, employed for supporting a superstructure, or a superincumbent weight, as a floor, the upper wall of a house when the lower part is sustained by pillars, the roadway of a bridge, and the like. Wooden girders are sometimes cut in two longitudinally and an iron plate inserted between the pieces, and the whole bolted together. This species of girder is called a *sandwich-girder*. For bridges cast-iron girders are sometimes cast in lengths of 40 feet and upwards, but when the span to be crossed is much greater than 40 feet, recourse is had to wrought-iron, or to *trussed*, *lattice*, or *box girders*, and cast-iron is now little used. A *trussed-girder* is a wooden girder strengthened with iron. A *lattice-girder* is a girder consisting of two horizontal beams united by diagonal crossing bars, somewhat resembling wooden lattice-work. A *box-girder* is a kind of girder resembling a large box, such as those employed in tubular bridges. There are also *bowstring-girders*, which are varieties of the lattice-girder, and consist of an arched beam, a horizontal tie resisting tension and holding together the ends of the arched rib, a series of vertical suspending bars by which the platform is hung from the arched rib, and a series of diagonal braces between the suspending bars.

Girdle of Venus (*Cestum Veneris*), an animal belonging to the actinozoa, found in the Mediterranean. In shape it resembles a ribbon, and it is apparently propelled by the cilia which fringe its edge. The mouth is situated on the inferior edge. It is iridescent by day, and brilliantly phosphorescent at night.

Girgeh (jĭr'je), a town, formerly capital, of Upper Egypt, on the left bank of the Nile. It possesses a Roman Catholic convent, the oldest in Egypt. Pop. 19,893.

Girgenti (jĭr-jen'tē), a town in the southwest of Sicily, capital of the province of same name, 68 miles S. S. E. of Palermo, a few miles from the sea, on an elevated site, with a cathedral, library, museum, etc. It exports wheat, oil, fruit, and sulphur, its port being Porto Empedocle. Near the town are the extensive and remarkable ruins of the ancient Agrigentum. Pop. 25,024.—The province has an area of 1490 square miles, and is rather mountainous in character. Pop. 371,638.

Girodet-Trioson (zhē-ro-dā-trē-o-sōn), ANNE LOUIS GIRODET DE ROUSSY, a French historical painter, born in 1767; died in 1824. Among his famous pictures are *Endymion*, *Hippocrates*, *The Deluge*, *Atala*, *Napoleon Receiving the Keys of Vienna*, and *St. Louis in Egypt*.

Gironde (zhē-rōnd), a department of France, on the Bay of Biscay, named from the Gironde estuary; area, 3160 square miles. The surface is generally flat, and almost the whole department belongs to the basin of the Gironde, which is formed by the junction of the Dordogne and Garonne. The climate is generally mild and extremely moist. One-third of the surface is waste, and about one-fourth is arable land. The staple production is wine, Médoc, Graves, Côtes, and Entre-deux-Mers being the most celebrated growths. (See *Bordelais Wines*.) The forests of oak and pine are extensive. The minerals are unimportant, but much salt is obtained from lagoons. The manufactures are varied; the trade, which has its center at Bordeaux, is very important. Bordeaux is the capital. Pop. (1906) 823,925.

Gironde, RIVER. See *Garonne*.

Girondists (zhē-rōnd-ists), GIRONDINS, one of the great political parties of the first French revolution. The Girondists were republicans, but were more distinguished for visionary ideals than for a well-defined policy; hence they fell an easy prey to the party of the Mountain. Their leaders were three of the deputies of the Gironde—Vergniaud, Guadet, and Gensonné, hence the name. Louis XVI was obliged, in 1792, to select a ministry from among

the Girondists, but it was short-lived. In the convention their struggles with the Montagnards forced them into extreme measures which they would otherwise have avoided. They wished to save the king, but many of them, from a mistaken policy, voted for his death. Their fall dates from their unsuccessful impeachment of Marat (1793), soon after which a large number of them were proscribed, and twenty-one executed.

Girton College, Cambridge, the most noted college for women in England. Opened in 1869 at Hitchin, it was removed to Girton, and opened in 1873. Newnham Hall, Cambridge (opened 1875), is also connected with it.

Girvan (gir'van), a seaport of Scotland, county of Ayr, situated at the head of a fine bay, on the Girvan. The winter herring fishery is the most important industry. Pop. 4024.

Gisors (zhē-sōr), a town of Northern France, department of Eure, with a well-preserved castle of the twelfth century. Pop. (1906) 4345.

Gissing (gis'ing), GEORGE ROBERT, novelist, born at Wakefield, England, in 1857; died in 1904. He made a close and accurate study of the London populace, and wrote a large number of novels, somber but strong life-pictures.

Gitschin (gich'in), a walled town of Northeastern Bohemia, in a fine valley, on the Cidlina. It has a castle built by Wallenstein, whose residence it was. Pop. 10,000.

Giulio Romano (jō'lē-ō rō-mä'nō), or GIULIO PIPPI, an Italian painter, architect, and engineer, the most distinguished of Raphael's scholars, born at Rome near the end of the fifteenth century. During the lifetime of Raphael he painted with him and under his direction, and many of his productions are quite in his manner. After having finished the fresco-work in the Hall of Constantine in the Vatican at Rome, under Clement VII, he went to Mantua, where he executed a series of remarkable works in architecture, painting, and engineering. The Palazzo del T (palace of the T) was rebuilt and ornamented entirely by him, or under his direction. After the death of San Gallo in 1546 the building of St. Peter's was committed to him, but he died the same year. After the death of Raphael he gave himself up to his own imagination, and astonished all by the boldness of his style, by the grandeur of his designs, by the fire of his composition, by the loftiness of his poetical ideas, and his power of expression.

Giurgevo (jur-jä'vō), a town in Roumania, on the Danube, opposite Rustchuk, the most important shipping port on the Roumanian side of the river. The Russians were defeated here by the Turks in 1854. Pop. 13,978.

Giusti (jus'tē), GIUSEPPE, an Italian satirical and political poet, born in 1809; died in 1850. He is considered by his countrymen as the rival of Béranger in popular lyrical poetry.

Givet (zhē-vā), a town of Northeastern France, in the Ardennes, with leather manufactories and other industries. It is a place of great strategic importance, and its citadel of Charlemont is of great strength. Pop. (1906) 5110.

Givors (zhē-vōr), a town of Southeastern France, department of the Rhône, and on that river, a center of the coal trade, with ironworks, glassworks, silk weaving and dyeing-works, etc. Pop. (1906) 11,444.

Gizeh (gē'ze), a town of Egypt, on the left bank of the Nile, opposite Old Cairo. Some miles off are the celebrated pyramids, which have been named from it. Pop. 11,500.

Gizzard (giz'ard), a strong muscular part of the alimentary canal of birds, which enables them to grind their food. A gizzard occurs also in many gasteropods, and in certain cephalopods and crustaceans. In birds it is lined by a thick muscular coat, and usually contains pieces of gravel, etc., to facilitate the grinding process.

Glace Bay, a port of Cape Breton, Nova Scotia, 15 miles from Sydney. Has large coal mines. Pop. 16,561.

Glacial Period (glā'shal), or ICE AGE, in geology denotes that portion of the post-tertiary period, in which Europe and North America, north of latitude 50°—40° were subjected to intense cold, and covered with ice and glaciers to a great depth. This phenomenon has been demonstrated from a study of the actual effects of glaciers in the Alps, and of varied traces of surface change and disturbance that could have had no other origin. The traces of ancient glacial action are abundantly discoverable in Britain and Scandinavia and in other parts of Northern Europe, and are profuse across nearly the whole width of North America. They are found also in the Himalayas and some other regions. See *Geology*.

Glacier (glā'sher) NATIONAL PARK. The government of the United States has for years been acquiring localities of great natural attraction, or remarkable for unique features, to be

kept permanently unchanged as public areas. Prominent among these are the Yellowstone and the Yosemite National Parks. An important addition to this series of national areas is the Glacier National Park, set aside by acts of Congress in 1910. This lies in Northern Montana, between the Canadian border and the line of the Great Northern Railroad. It contains about a million acres, being second in area only to Yellowstone Park. The region is one of natural wonders, which range from verdant valleys and wooded heights to glacial peaks. Within the area are numerous glaciers and mountain lakes, the locality presenting many examples of sublime scenery. Birds and animals are numerous, and the locality as a whole forms a splendid addition to our series of national pleasure grounds.

Glaciers (glā'shers), icy masses of great bulk, harder than snow, yet not exactly like common ice, which cover the summits and sides of mountains above the snow-line. They are found in Switzerland, Scandinavia, the Andes, the mountains of Alaska, in

Glacier of Zermatt, Switzerland.

many parts of the Rocky Mountain range, etc. They extend down into the valleys often far below the snow-line, and bear a considerable resemblance to a frozen torrent. They take their origin in the higher valleys, where they are formed by the congelation and compression of masses of snow in that condition called by French writers *névé*, by German authors *firn*. The ice of glaciers differs from that produced by the freezing of still water, and is composed of thin layers filled with air-bubbles. It is likewise more brittle and less transparent. The glaciers are continually moving downwards, and not infrequently reach the borders of cultivation. The rate at which a glacier moves generally varies from 18 to 24 inches in twenty-four hours. At its lower end it is generally very steep and inaccessible. In its middle course it resembles a frozen stream with an undulating surface, broken up by fissures or *crevasses*. As it descends it experiences a gradual diminution from the action of the sun and rain, and from the heat of the earth. Hence a phenomenon universally attendant on glaciers—the issue of a stream of ice-cold turbid water from their lower extremity. The descent of glaciers is shown by changes in the position of masses of rock at their sides and on their surface. A remarkable glacier phenomenon is that of *moraines*, as they are called, consisting of accumulations of stones and detritus piled up on the sides of the glacier, or scattered along the surface. They are composed of fragments of rock detached by the action of frost and other causes. The fissures or crevasses by which glaciers are traversed are sometimes more than 100 feet in depth, and from being often covered with snow are exceedingly dangerous to travelers. One of the most famous glaciers of the Alps is the Mer de Glace, belonging to Mont Blanc, in the valley of Chamouni, about 5700 feet above the level of the sea. It is more especially, however, in the chain of Monte Rosa that the phenomena of glaciers are exhibited in their greatest sublimity, as also in their most interesting phases from a scientific point of view. Glaciers exist in all zones in which mountains rise above the snow-line. Those of Norway are well known, and they abound in Iceland and Spitzbergen. Hooker and other travelers have given accounts of those of the Himalaya. They are conspicuous on the Andes, while the Southern Alps of New Zealand rival in this respect the Alpine regions of Switzerland.

The problem of the descent of the glaciers is of extraordinary interest, and various theories have been put forward to account for it. It was shown by Professor J. D. Forbes, of Edinburgh, that a glacier moves very much like a river; the middle and upper parts faster than the sides and the bottom; and he showed that glacier motion was analogous to the way in which a mass of thick mortar or a quantity of pitch flows down in an inclined trough. His theory is known as the *viscous theory* of glaciers, which presupposes that ice is a plastic body, and this plasticity has been satisfactorily explained by Professor James Thomson, of Glasgow, by the phenomenon of the melting and refreezing of ice. Water, he dis-

covered, when subjected to pressure, freezes at a lower temperature than when the pressure is removed. Consequently, when ice is subjected to pressure it melts; if it is relieved of pressure the water again solidifies. Therefore if two pieces of ice are pressed together, they tend to relieve themselves by melting at their points of contact, and the water thus produced immediately solidifies on its escape. If ice is strained in any way it similarly relieves itself at the strained parts, and a similar regelation follows. This, when applied to the glaciers, gives a complete explanation of their plasticity. Pressed downwards by the vast superincumbent mass, the ice gradually yields. Melting and refreezing takes place at at strained points goes on. In the latter some parts, at others the gradual yielding process there is no visible melting, but there is the gradual yielding from point to point to the pressure above, and there is the transference relatively to each other of the molecules that constitute the, at first sight, solid mass. If, however, at certain points the strain is intense, the ice becomes extremely brittle. The latter fact disposes of Tyndall's objection to Forbes's theory, which was based on the fact that *crevasses* proved the brittleness, and not the viscosity of ice.

Glacier Tables, large stones found on glaciers supported on pedestals of ice. The stones attain this peculiar position by the melting away of the ice around them, and the depression of its general surface by the action of the sun and rain. The block, like an umbrella, protects the ice below it from both; and accordingly its elevation measures the level of the glacier at a former period. By and by the stone table becomes too heavy for the column of ice on which it rests, or its equilibrium becomes unstable, whereupon it topples over, and falling on the surface of the glacier covers a new space of ice, and begins to project afresh.

Glacis (glā'sis), in fortification, is the sloping surface of the outermost portion of a fortified line, descending from the parapet of the covered way to the level ground or open country in front. It must be so placed that the guns of the fort will rake it at every point.

Gladbach, Bergisch- (berg'ish-glät'-bäh), a manufacturing town of Prussia, province of Rheinland, 8 miles northeast of Cologne. Pop. (1905) 13,410.

Gladbach, Mönchen- (meun'hen-glät'bäh), a town of Prussia, province of Rheinland, 16 miles west of *Düsseldorf*, with extensive manufactures of cotton and mixed cotton goods, etc. Pop. (1905) 60,714.

Gladden, Washington, author, born at Pottsgrove, Pennsylvania, in 1836; was ordained in the Congregational Church, and became a pastor in Columbus, Ohio, in 1882. He has written very largely on social reforms and other subjects, among his books being *Tools and the Man*, *Social Salvation*, *Christianity and Socialism*, *The Church and Modern Life*, etc. Died July 2, 1918.

Gladiators (glad-i-ā'turs), combatants who fought at the public games in Rome for the entertainment of the spectators. The first instance known of gladiators being exhibited was in B.C. 264, by Marcus and Decimus Brutus at the funeral of their father. They were at first prisoners, slaves, or condemned criminals; but afterwards freemen fought in the arena, either for hire or from choice; and later men of senatorial rank, and even women, fought. The regular gladiators were instructed in schools (*ludi*), and the overseer (*lanista*) purchased the gladiators and maintained them. Men of position sometimes kept gladiatorial schools and lanistæ of their own. The gladiators fought in the schools with wooden swords. In the public exhibitions, if a vanquished gladiator was not killed in the combat, his fate was decided by the people. If they wished his death, perhaps because he had not shown sufficient skill or bravery, it is stated that they held up their thumbs; the opposite motion was the signal to save him. This, however, is doubtful, the meaning of the terms used to express it being uncertain. According to some authors, the significance of the thumb movement was the reverse of that above stated. The victor received a branch of palm or a garland. The gladiators were classified according to their arms and mode of fighting; thus there were *retiarii* who carried a trident and a net (L. *rete*) in which they tried to entangle their opponent; *Thracians*, who were armed with the round Thracian buckler and a short sword; *secutores*, who were pitted against the *retiarii*, etc.

Gladiolus (gla-dī'ō-lus), a genus of plants of the iris order, having a bulbous root with a recticulated covering, natives of Europe and N. Africa, but especially S. Africa. The leaves are ensiform, the flowers brilliantly colored. There are many species, some of them popular garden plants, others grown in hothouses.

Gladstone (glad'stun), Herbert John, son of the fa-

mous statesman, William E. Gladstone, was born at London in 1854. He was educated at Eton and Oxford and entered parliament in 1880, being private secretary to his father, then prime minister, in 1880-81, and subsequently holding various positions in the treasury, the war, and the home offices, being first commissioner of works 1894-95, and subsequently secretary of state for home affairs. In 1909 he was appointed governor-general of the newly organized commonwealth entitled the Union of South Africa.

Gladstone, WILLIAM EWART, a celebrated statesman, son of Sir John Gladstone, was born at Liverpool in 1809. He entered Eton 1821, and left it in 1827, becoming afterward a student of Christ Church, Oxford. He left college in 1831, having taken high honors. After leaving Oxford he spent six months in Italy. In 1832 the first Reform Act was passed, and Mr. Gladstone's public career commenced by his being returned for Newark, and in 1834

Right Hon. W. E. Gladstone

accepting the post of Junior Lord of the Treasury in Peel's cabinet. At this period he was a Tory, and as his party quickly went out it was not until 1841 that he again held any public office, in which year he became, under Peel, Vice President of the Board of Trade and Master of the Mint. In 1842 great fiscal reforms were inaugurated, some of which were understood to be due to Mr. Gladstone. Having become President of the Board of Trade, he carried, in 1843, a measure for the abolition of restrictions on the exportation of machinery, and in 1844 he carried a railway bill, establishing cheap trains. He took part with Peel in the repeal of the corn-laws, a course which cost him his seat for Newark. In 1847 he was returned for Oxford University, and he then supported the bill for the removal of Jewish disabilities, the repeal of the Navigation Laws, etc. He now began to develop remarkable ability as a financier, and fiercely attacked Mr. Disraeli's budget of 1852. The same year he became Chancellor of the Exchequer under the Earl of Aberdeen, a post which he also held for a short time in 1855 under Lord Palmerston. In 1858 he became High Commissioner Extraordinary to the Ionian Islands, and his *Studies on Homer* appeared about the same time. In 1859 he again took office as Chancellor of the Exchequer under Lord Palmerston. At the general election of 1865 Mr. Gladstone was returned for South Lancashire, and on the decease of Lord Palmerston he became the Liberal leader in the Commons in the Russell administration, still continuing to hold the Chancellorship of the Exchequer. The government, being defeated on the reform question, went out in 1866, and Lord Derby came into power. In 1867 a Reform Bill, establishing household suffrage in burgs, was carried by the Conservatives, but to the final shape of it Mr. Gladstone and Mr. Bright materially contributed. In 1868 Mr. Gladstone succeeded in abolishing compulsory church rates, and he also carried his resolutions dealing with the Irish Church, but his Irish Church Suspensory Bill was rejected by the Lords. At the general election of 1868 he lost his seat for South Lancashire, but was returned by Greenwich. There being a great Liberal majority in the new parliament, Mr. Disraeli was soon forced to resign, and Mr. Gladstone became premier. Next year he carried his bill for the disestablishment of the Irish Church, and in 1870 his Irish Land Act. In 1871 army purchase was abolished. The Ballot Act was passed in 1872, the *Alabama* claims were settled, and the Scottish Education Act enrolled on the statute-book. Parliament was dissolved in 1874, and the Conservatives ousted Mr. Gladstone from office, as they had secured a good majority. During Lord Beaconsfield's tenure of office Mr. Gladstone denounced the Bulgarian atrocities, the Anglo-Turkish Treaty, and the Afghan War, and his speeches during his candidature for Midlothian greatly helped to render the government unpopular. In 1880 the general election reinstated Mr. Gladstone firmly into power (Midlothian being now his constituency), and his second Irish Land Bill became law in the following year. In 1882 a

Prevention of Crimes and an Arrears Act for Ireland were passed, and in 1883 measures relating to bankruptcy, etc., were also carried. In 1884 the bill extending household suffrage to the counties was carried, and the Gladstone ministry fell the next year. Lord Salisbury, who had formed an administration, got the Redistribution of Seats Bill passed, and under it took place the general election of 1885, Mr. Gladstone still continuing to represent Midlothian. Next year Lord Salisbury resigned after an adverse vote in the Commons, and Mr. Gladstone again came into power. He soon startled the country by introducing a measure of Home Rule for Ireland. It failed to pass the Commons, and an appeal was made to the country, the result of which was emphatically adverse to Mr. Gladstone's proposals. He had to make way for Lord Salisbury. In 1892 the result was again reversed; Gladstone once more resumed authority; he resigned March 2, 1894, and died May 19, 1898, being interred with a State funeral at Westminster Abbey.

Glagolitic Alphabet (glag-o-lit'-ik), an ancient Slavonic alphabet. The Slavonic languages have from very ancient times been written with two alphabets, the glagolitic and cyrillic. The latter is the modern Slavonic and Russian alphabet; the former is still used in Istria, Croatia, and Dalmatia, and its use has been authorized in the Roman Catholic liturgies of those districts.

Glair (glār), the white of eggs, used as a varnish for preserving paintings. Bookbinders also use it for finishing the backs of books.

Glaisher (glā'sher), an English aeronaut and meteorologist, born in 1800, died in 1903. His balloon ascent of 37,000 ft. [illegible] highest on record.

Glamorgan (gla-[illegible]gan), or GLAMORGANSHIRE, a county in South Wales; area, 576,540 acres. The north and northeast parts of the county are extremely mountainous, and often exhibit scenes of the most romantic beauty. The southern portion is comparatively level and very fertile, particularly the Vale of Glamorgan. The climate in this part is remarkably mild, as snow does not lie long on the ground, and tender shrubs thrive in the open air. Glamorganshire belongs wholly to the basin of the Severn; and all its streams, of which the Taff is the largest, flow in a south direction. The cattle are reckoned among the best in Wales. The mineral wealth of Glamorganshire is of incalculable value. Its coal-fields, its stores of ironstone and limestone, are most extensive, and the ironworks of Dowlais and Cyfarthfa are among the largest in the world. The woolen manufacture is carried on to some extent. Principal towns—Cardiff, the capital; Merthyr-Tydfil, Swansea, and Neath. The county returns five members to the House of Commons. Pop. 1,130,818.

Glance (glans), a name given to some minerals which possess a metallic or pseudometallic luster; as *antimony glance, bismuth glance, cobalt glance*, etc.

Glance-coal. See *Anthracite.*

Glanders (glan'ders), one of the most formidable diseases to which horses are subject, indicated by a discharge of purulent matter from the points of contagion, sometimes one or both nostrils, with a hard enlargement of the submaxillary glands. In acute glanders the discharge, by its copiousness, impedes respiration and ultimately produces suffocation. The disease is highly infectious, and may easily be communicated to man by the purulent matter coming in contact with the skin or mucous membrane. The disease is treated by mallein. See also the article *Farcy.*

Glands, a certain class of structures in animals, some of them forming organs which are the seat of an excretion, and provided with an excretory canal. In man there are two lachrymal glands, situated at the external angle of the eyes under the upper eyelid; six salivary, of which three are on each side, behind and under the lower jaws; two parotid, two submaxillary, two sublingual, two mammary, confined to the female (the breasts in women); the liver, the pancreas, the two kidneys, etc. The lymphatic glands, which take up and elaborate the lymph, are somewhat different from these in character; and still more different are certain other bodies denominated the ductless glands, as the spleen, thymus, pineal, thyroid, pituitary, and suprarenal (or adrenal). Botanists have given the name of glands to small bodies observed upon the surfaces of plants, and many of which seem to secrete certain fluids.

Glanvil, or GLANVILLE (glan'vil), RANULPH DE, English lawyer and warrior of the 12th century. In the reign of Henry II he held the office of justiciary, and repelled the invasion of William the Lion, King of Scotland, who was taken prisoner as he was besieging the Castle of Alnwick. Richard I is said to have imprisoned Glanvil,

and obliged him to purchase his freedom with £15,000 towards a crusade to the Holy Land. He accompanied his master on this expedition, and perished at the siege of Acre in 1190. To Glanvil is attributed a treatise on the laws and customs of England (*De Legibus et Consuetudinibus Angliæ*), written about 1181, and first printed in the year 1554, being the earliest treatise on English law.

Glarus (glä'rös), a Swiss canton, surrounded by St. Gall, the Grisons, Uri, and Schwyz, area 266 sq. miles. On all sides, except towards the north, Glarus is walled in by lofty mountains; lakes are numerous, and the scenery in their neighborhood is magnificent. The inhabitants are chiefly engaged in the cotton manufacture and in agricultural pursuits, rearing sheep and cattle, and exporting cheese, butter, etc. The constitution is a pure democracy. Pop. 33,349. The capital, Glarus, situated on the Linth amid grand scenery, is a well-built town, with a good trade. Pop. 6000.

Glasgow (glas'kō or gō), the largest city in Scotland, and the second in size in Great Britain, is situated mainly in the county of Lanark (a small portion being in Renfrew), on both banks of the Clyde, the larger and more important part of it on the right or north bank. The southern portion is built on low-lying level ground, the northern portion to a great extent on a series of elevations of varying heights. The streets are in general wide and straight, running mostly at right angles east and west, and north and south. Of the former may be mentioned as a great thoroughfare the Trongate and its continuation Argyle Street, of the latter Buchanan Street. The houses are built almost wholly of freestone, and as a whole Glasgow is now excelled by few cities in the kingdom in architectural beauty. Of the buildings the cathedral, situated in the northeast of the city, is the only one of historical interest. It is supposed to have been begun about 1240, and completed within the next two centuries. It is a large Gothic edifice in the early Pointed style, with tower and spire from the center; length of interior 319 feet; width 63 feet; height of nave 90 feet, of choir 85 feet, spire 225 feet. It is especially distinguished for the beauty of its crypt, one of the most perfect in Britain. The windows are filled with painted glass on a uniform plan. The University of Glasgow was founded in 1451, and is now a flourishing institution. Connected with it is the Hunterian Museum of anatomy, natural history, etc., left by Dr. William Hunter. The Municipal Buildings, in the center of the city, in George Square, form an imposing pile in the Renaissance style. They were completed in 1887. Most of the public monuments are collected in George Square, the finest square in the city. Glasgow has several public parks, the largest, the Green, containing 140 acres. There are also Botanic Gardens with extensive hothouses. There is a collection of pictures belonging to the city, and containing a number of very valuable works especially of the Venetian school. The industries are unequaled for variety by any town in the kingdom, with the exception, perhaps, of London. They embrace cotton, linen, woolen, silk, and jute, in all the processes of manufacture; calico-printing, dyeing, and bleaching; pig and malleable iron and steel, and machinery and metal goods of all descriptions; shipbuilding, which might almost be called a staple, over 400,000 tons of shipping having been launched in some years on the Clyde; extensive chemical works, potteries, glassworks, brickworks, breweries, distilleries, tanneries, tobacco-works, sugar-refining works, etc. The commerce is commensurate in extent with the manufactures. The river itself, the chief highway of this commerce, has been navigable for large vessels up to the heart of the city, and the harbor accommodation has been and is still being extended by the construction of docks, quays (of which there are over 6 miles), and other improvements. In the extent of its merchant marine Glasgow is surpassed by few cities in the world. The improvement of the navigation of the Clyde, which within the past century was fordable at and below the present harbor of Glasgow, has been of immense service to the city, though the total cost of deepening, widening, straightening, and the construction of quays, docks, etc., has exceeded $100,000,000. The [illegible]lways and the Forth and Clyde and [illegible]onkland Canals form important aux[illegible]y means of communication. Horse tra[illegible]ways pass along the principal streets, and are under municipal control. In a sanitary point of view Glasgow has greatly improved in recent times, but it still remains less healthy than it might be. During recent years the whole municipal expenses have been defrayed without any direct taxation; the profits made by the city in street-cleaning, gas, water, tramways, etc., leaving a margin over all costs of government. The city is well supplied with water from Loch Katrine.

Glasgow is a very ancient city. Its origin may be traced back to the foundation of the bishopric by St. Mungo.

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about 560. It was erected into a royal burgh in 1180. The first bridge was built in 1345. Its industrial importance did not begin until after the union in 1707, its previous trade being chiefly with Europe. The Union opened up the trade with the American colonies, and tobacco became a source of wealth to the Glasgow merchants. Commerce then began to take other directions, and the progress made within the nineteenth century was remarkable. Pop. in 1610, 7644; 1712, 13,832; 1801, 77,385; 1901, 761,109. The city had grown to over a million inhabitants (1,095,171) by the beginning of 1918. The rateable value was given as £7,703,078. In addition there are large suburbs, and the city of Paisley (population 86,593) is situated on the outskirts.

Glass, an artificial substance, hard, brittle, and in its finest qualities quite transparent, formed by the fusion of silicious matters with an alkali. Of the origin of its manufacture nothing is known, but the ancient Egyptians carried the art to great perfection, and are known to have practiced it as early as 2000 B. C., if not earlier. The Assyrians the Phœnicians, the Greeks and Etruscans were all acquainted with the manufacture. The Romans attained peculiar excellence in glassmaking, and among them it was applied to a great variety of purposes. Among the most beautiful specimens of their art are the vases adorned with engraved figures in relief; they were sometimes transparent, sometimes of different colors on a dark ground, and very delicately executed. The Portland or Barberini vase is almost the only surviving specimen of its kind. The mode of preparing glass was known long before it was thought of making windows of it. The first mention of this mode of using glass is to be found in Lactantius, in the third century after Christ. St. Jerome also speaks of it being so used (422 A. D.). Benedict Biscop introduced glass windows into Britain in A. D. 647. In church windows it was used from the third century. The Venetians were long celebrated for their glass manufacture, which was established before 700 A. D. Britain did not become distinguished for glass until about the commencement of the sixteenth century. The excise laws relative to the glass manufacture were at one time complicated in the extreme, and tended to check improvements in glassmaking. These laws were repealed in 1845 by Sir Robert Peel, as part of his free-trade policy, and beneficial effects were immediately apparent in the improved quality, cheapness and greater variety of descriptions of glass produced. Glass is largely made in France, Germany, Belgium and the United States, great quantities of it being here produced.

Glass is formed by the fusion of silicious matter, such as powdered flint or fine sand, together with some alkali, alkaline earth, salt, or metallic oxide. The nature of the glass will depend upon the quality and proportion of the ingredients of which it is formed; and thus an immense variety of kinds of glass may be made, but in commerce five kinds only are usually recognized: 1. Bottle or coarse green glass. 2. Broad, spread, or sheet window-glass. 3. Crown-glass, or the best window-glass. 4. Plate-glass, or glass of pure soda. 5. Flint-glass, or glass of lead. Colored glass may be mentioned as a sixth kind. The physical properties of glass are of the highest importance. Perhaps the chief of these is its transparency, and next to that its resistance to acids (except hydrofluoric). It preserves its transparency in a considerable heat, and its expansibility is less than that of any other known solid. Its great ductility, when heated, is also a remarkable property. It can, in this state, be drawn into all sorts of shapes, and even be spun into the finest of threads. It is a bad conductor of heat, and is also very brittle. It is usually cut by the diamond.

The works in which glass is made are called *glass-houses*. They are commonly constructed of brick, and made of conical form. A large vault is made in the interior of the cone, extending from side to side, and of sufficient height to allow workmen to wheel in and out rubbish from beneath the furnace, which is placed over the vault, and separated from it by an iron grating. The materials used for the formation of the glass are sometimes calcined in a *calcar* or *fritting furnace*, and a chemical union between the ingredients commenced, forming a *frit*. But this process is not essential, and the materials, after being ground and thoroughly mixed up together, are now usually placed at once in *melting pots* or crucibles made of fire-clay, the melting-pots being then placed in the melting furnace or oven. This is a kind of reverberatory furnace, is often circular in form, arched or domed above, and capable of keeping up an immense heat. The crucibles are placed in the furnace at equal distances from each other round the circumference, each pot being opposite to an opening in the wall of the furnace in order that the crucible may be charged or discharged by the workman from without. In recent times a furnace called a *tank* furnace has come into use and enables melting pots to be dispensed with, as the material can be melted in

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and worked from the furnace directly. The use of the *annealing furnace* is also essential in glassmaking, the process of allowing the glass to cool there being called *annealing*. Unless this process be very carefully managed, however, the articles formed in the glass-house will be of no use, from their liability to break by the slightest scratch or change of temperature.

Sheet glass is the commonest description of glass. It is composed of various ingredients in varying proportions, usually of sand, chalk or limestone, sulphate of soda, and cullet or broken glass. A coarse variety of it may be made of a mixture of two parts by measure of soapboilers' waste, one of soda-ash and one of cleaned sand. In France the materials employed are commonly:—sand 100 parts, sulphate of soda 30, carbonate of lime 30, coke to aid in the reduction of the sulphate of soda 5, with some dioxide of manganese to correct the greenish tinge that glass with a soda base possesses. When the materials are properly melted a quantity is taken out of the pot on the end of an iron tube about 5 ft. long, and the workman by blowing into and swinging the tube while heating and reheating the glass, imparts a cylindrical shape to the newly-formed product. The rounded extremity of the cylinder (which may be 4 ft. long or more) is softened in the furnace in order to enable the workman to blow a hole in it. This opening may be made by heating the cylinder and then stopping up the tube with the thumb, when the expansion of the air causes the cylinder to burst open at the end. The other rounded end is detached after cooling by winding round its circumference a thread of red hot glass, which causes a clear fracture. The cylinder is now split open parallel to its axis by a diamond, and then conveyed to the *flattening furnace* where it is heated and opened out into a flat sheet of glass. It is afterwards placed in the annealing furnace.

Crown glass is differently formed by different makers, but its composition is essentially the same as the best sheet glass. It used to be the only window-glass made, but its manufacture has been almost altogether superseded by that of sheet glass. The ingredients being melted and at the proper temperature, a quantity of the glass is withdrawn by the tube (to the amount, by successive addition, usually of 10 lbs. in all). By various manipulations this, from having the form of a hollow oblate spheroid, is made to assume the form of a thin circular plate, with a thick part called the *bull's eye* in the center, being the point at which an iron rod is attached to it for the purpose of causing it to revolve rapidly and spread out into a sheet before the furnace. The bull's eye used to be commonly seen in the windows of humble dwellings, the pieces of glass containing them being cheap.

Flint glass or Crystal is one of the kinds largely made, being employed for table utensils, globes, ornaments, etc. Powdered flint was formerly employed in its manufacture, but fine white sand has been substituted. The other materials are red lead or litharge, and pearl-ash (carbonate of potash). The following is said to be a good mixture:—Fine white sand, 300 parts; red lead or litharge, 200; refined pearl-ash, 86; niter, 20; with a small quantity of arsenic and manganese. The furnace is kept at a very high temperature until the whole of the materials are fused. When the glass becomes translucent the temperature is diminished until it becomes a tenacious mass. Suppose a glass vessel is to be made, the iron tube is put into the crucible, and the required quantity of glass lifted out, which after certain adjustments is rolled into a cylindrical form on an iron table called the *merver* or *marver*. The workman then blows the glass into the form of a hollow globe, and re-heats and blows until the globe becomes of the required thinness. An iron rod called the *punty* is now attached to the end of the glass furthest from the tube, and the tube detached. The workman now heats the glass on the punty, and sitting down upon a chair with smooth arms, he lays the punty upon them, and rolling it with his left hand he gives the glass a rotatory motion, while with an instrument in his right, somewhat like a pair of sugar-tongs, he enlarges or contracts the different parts of the vessel until it assumes the requisite shape. A pair of shears is also made use of in certain cases. The article is then detached from the punty, and carried to the annealing furnace. Many of the articles, after coming from the annealing furnace, are sent to the cutter or grinder. The operation of grinding is performed by wheels of various diameter and of various edges, some of iron, others of stone, and some of wood. Rich and delicate designs may be cut upon the articles by means of small wheels of copper and steel upon which emery is kept constantly falling. Ornamental figures may also be engraved, or rather etched, upon articles of glass by means of hydrofluoric acid, care being taken to place a coating of some substance over the parts not to be

acted upon. Various ornamental forms are given to the surface of glass vessels by metallic molds. The mold is usually copper, with the figure cut on its inside, and opens with hinges to permit the glass to be taken out. The angles of molded objects are always less sharp than those of cut-glass.

Green or *bottle-glass* is formed of the coarsest materials, such as coarse sea or river sand, lime, and clay, and the most inferior alkalies, as soapboilers' waste, and the slag of iron ore. A cheap mixture for this kind of glass may be made of common sand and lime, with a little clay and sea salt. The manipulations of the glassblower in fashioning bottle-glass into various forms are in general the same as those performed by the flint-glass blower. Wine and beer bottles, which are required to be all of a certain capacity, are blown in molds, so that their containing portion may be as nearly as possible of the requisite size. When the articles are made they are carried to the annealing furnace. Green bottle-glass is preferable to all other kinds for vessels required to contain corrosive substances; it is less fusible than flint glass, and thus the better adapted to many chemical purposes.

Plate-glass is a fine and thick glass cast in sheets. One maker's ingredients are as follows:—white sand, 300 lbs.; soda, 200; lime, 30; oxide of manganese, 2; oxide of cobalt, 3 oz.; and fragments of glass (cullet) equal to the weight of sand. After being melted in large crucibles, and the liquid glass having been thoroughly skimmed, it is transferred by a copper ladle to smaller pots (*cuvettes*). When the glass in the smaller crucible is ready for casting it is poured upon an iron *casting-table*, and a large metal cylinder moved along spreads the glass into a broad uniform sheet. The subsequent stages of the process are concerned with the discovery of flaws, the squaring of the edges, the grinding of the surfaces plane, the grinding of the sides, and the polishing. Before grinding and polishing the glass is what is called common 'rough plate,' and in this state it is much used for roofing, cellar-lighting, etc., being non-transparent. 'Rolled plate,' which is cast on a table that imparts a surface of grooves, flutings, lines, etc., is extensively used for the same purposes.

There are several other kinds of glass that may be noticed. *Pressed glass* is *flint glass* formed into articles by pressing into moulds of iron or bronze, a fine surface being afterwards attained by heating so that a thin film on the surface melts. *Slag glass* is glass from the slag of blast-furnaces mixed with other ingredients; it is largely used for bottles. *Optical glass* is made of special varieties of flint and crown glass. *Strass*, which is used for imitating gems, is a very dense flint glass, colors being imparted by metallic oxides. *Spun glass* is glass in the form of very fine threads, in which state it may be woven into textile fabrics of great beauty. *Triplex glass* is made by covering a face of each of two sheets of glass with very thin gelatin and placing between them a very thin sheet of celluloid. These are then subjected to hydraulic pressure. Triplex glass will crack but not fly in splinters or separate.

Colored Glass.—Colored glass is of two kinds—entirely colored, the coloring matter being melted along with the other ingredients; or partially colored, a quantity of white glass being gathered from one pot, and dipped into the other containing the colored glass, by which the whole receives a skin of colored glass. The coloring matters are chiefly the metallic oxides. A beautiful yellow color is imparted by silver in union with alumina (powdered clay and chloride of silver being used), also by uranium and by glass of antimony; red colors by oxide of iron, copper, and gold; green by protoxide of iron, oxide of copper, oxide of chromium, etc.; blue by cobalt; orange by peroxide of iron with chloride of silver.

Glass, Carter (1858-), an American cabinet officer, born at Lynchburg, Virginia. He entered the newspaper business, becoming owner of the Lynchburg *News*. For twenty years he was a member of the city council of Lynchburg, and was a member of the Virginia senate, 1899-1903. Elected congressman to fill the unexpired term of 1902-03, he continued in congress till 1918, when he succeeded William G. McAdoo (q. v.) as secretary of the treasury.

Glass-painting, the art of producing pictures upon glass with colors that are burned in, or by the use of pieces of colored glass, in which the color forms part of the composition of the glass itself. Originally there was but one method of making ornamental glass windows, which was by the latter process; the pieces of stained or colored glass were cut to the desired shape, and let into the grooves of finely-made leaden frames which formed the pattern in outline, so that the pictures resembled mosaic work. In the sixteenth century, the *enamel* colors having been discovered, a new process came into vogue, the designs being now painted on

the glass and burned in. At the present day the two methods, or a combination of the two, are chiefly employed, the *mosaic-enamel* method being the most common, and consisting of a combination of these two. The chief seats of the art in Britain are Birmingham and Edinburgh; in France, Paris and Sèvres; in Germany, Munich and Nürnberg; in America, Philadelphia and Pittsburgh.

Glass Paper, or CLOTH, is made by strewing finely pounded glass on a sheet of paper or cloth which has been besmeared with a coat of thin glue, the glue being still wet. It is much used for polishing metal and woodwork.

Glassport, a borough in Allegheny County, Pennsylvania. It has foundries and manufactures of steel, gears, edge-tools, spikes, rivets, flint glass, etc. Pop. 5540.

Glass-Snake, a lizard, genus *Ophiosaurus*, in form resembling a serpent, and reaching a length of 3 feet. The joints of the tail are not connected by caudal muscles, hence it is extremely brittle, and one or more of the joints break off when the animal is even slightly irritated.

Glass-sponges. See *Sponge*.

Glasswort (glas'wurt), a name given to the plants of the genus *Salicornia*, nat. order Chenopodiaceæ, succulent marine herbs growing abundantly on the coasts in the south of Europe and north of Africa, and when burned, yielding ashes containing soda, formerly much employed in making both soap and glass.

Glastonbury (glas'en-bėr-i), a town of England, county of Somerset, which derives interest from the ruins of its once magnificent Benedictine abbey, now consisting of some fragments of the church, the chapel of St. Joseph of Arimathea, and what is called the abbot's kitchen. Its abbots sat among the barons in Parliament. The last was hanged on a neighboring eminence by order of Henry VIII for refusing to surrender the abbey. Pop. 4251.

Glatz (glätz), a town of Prussia, province of Silesia, on the Neisse, 51 miles S. S. W. of Breslau; manufactures of linen, cotton, and woolen goods, leather, carpets, etc. It has a fortress or citadel, now of little importance. Pop. (1905) 16,051.

Glauber (glow'ber), JOHN RUDOLPH, a German chemist, born in 1603 or 1604. His life seems to have been somewhat unsettled—at least he resided in many different places—Vienna, Saltsburg, Frankfort, Kitzingen, Cologne, and Basel, and finally in Amsterdam, where he died in 1668. He is chiefly remembered for his discovery of sulphate of soda or *Glauber's Salt*, which he termed *sal mirabile*, in consequence of his great faith in its medicinal qualities.

Glauber's Salt, sulphate of sodium, so called because of the importance attached to its chemical and medicinal properties by Glauber. It forms large, colorless, monoclinic prisms, which effloresce on exposure to the air. It is soluble in water, and when heated melts in its water of crystallization. It is found in many localities, both dissolved in the water of mineral springs and of salt lakes, round which it effloresces.

Glauchau (glou'hou), a manufacturing town of Saxony, on the Mulde, 54 miles W. S. W. of Dresden. It has manufactures of woolens, carpets, linens, leather, dyeworks, print-fields, and worsted mills. Pop. (1905) 24,556.

Glaucoma (glą-kō'ma), in medicine, an almost incurable disease of the eye, in which the eyeball becomes of stony hardness by the accumulation of fluid within, and the consequent increase of pressure causes disorganization of all the tissues. Loss of sight is sometimes very rapid. Called also *Glaucosis*.

Glazing (glāz'ing) is the covering of earthenware vessels with a vitreous coating in order to prevent their being penetrated by fluids. The materials of common glass would afford the most perfect glazing were it not liable to crack. See *Pottery*.

Glazounof (glä'zō-nof), ALEXANDER CONSTANTINOVITCH, a Russian composer, born at St. Petersburg, August 10, 1865. He belongs to the advanced Russian school and in 1906 was appointed director of the St. Petersburg Conservatory. He has composed a number of symphonic poems, and other instrumental music; also cantatas and songs.

Gleaning (glēn'ing), the gathering by poor people of the loose ears of corn left uncared for by reapers. This is a common practice in England.

Glebe (glēb), in the established churches of England and Scotland, the land possessed as part of the revenue of an ecclesiastical benefice, usually along with a dwelling-house. The incumbent may be regarded as the proprietor of the glebe for the time being, but he cannot alienate it. In Scotland, where lands are arable, the glebe must

consist of 4 acres at least. The glebe must be taken as near the manse as possible.

Gleditschia (glē-dish'i-a), a genus of plants, order Leguminosæ, to which *G. triacanthos*, the honey-locust, belongs.

Glee (glē), in music a composition in three or more parts, generally consisting of more than one movement, the subject of which may vary greatly, from grave to gay, etc. Instrumental accompaniment is illegitimate.

Gleemen (glē'men), itinerant singers in the Anglo-Saxon period of English history. After the Norman conquest they were termed *minstrels*.

Gleiwitz (glī'vits), a town of Prussia, province of Silesia, on the Klodnitz. It has extensive government ironworks, foundries, machine-works, glassworks, worsted and other mills, etc. Pop. (1910) 66,910.

Glencoe (glen'kō), a romantic Scottish valley in the county of Argyle, near the head of Loch Etive. It is bounded both sides by almost perpendicular mountains over 3000 feet high, and is traversed by a mountain stream, Ossian's 'dark torrent of Cona.' The valley was the scene of a tragedy known as the 'Massacre of Glencoe.' The state of the Highlands after 1690 was a subject of great anxiety to the government. Although the Highlanders had ceased any important operations since the death of Dundee at Killiecrankie, they had not laid down their arms. In 1691 a proclamation was issued promising pardon to all who should swear allegiance on or before 31st December. All the chiefs, with the exception of one Ian of Glencoe, complied. The latter had unfortunately exceeded the prescribed period, and a certificate which he produced to prove that he had offered to take the oaths at Fort-William was suppressed, as is thought, by Stair. The king's signature was obtained to an order to extirpate the MacDonalds. On the 1st of February, 1692, a party of soldiers, 120 in number, commanded by Captain Campbell of Glenlyon, marched up the glen and took quarters as friends. The soldiers belonged mostly to the clan Campbell, enemies of the MacDonalds; but they were well treated, and all went on merrily for twelve days. At five in the morning of the 13th Glenlyon and his men suddenly fell on the MacDonalds. Thirty-eight men were murdered, and many who had escaped perished in the snow, sank into bogs, or died for lack of food. Much obloquy has been heaped upon King William on account of his share in the massacre, but the utmost of what he would seem to have been guilty was carelessness in signing without investigation the order mentioned above.

Glendower (glen'dou-ėr), Owen, a distinguished figure in Welsh history, born about 1350. At an early age he was sent to London, and studied for the bar, but relinquished the profession on being appointed an esquire to Richard II, whom he supported to the last. He carried on a contest with Lord Grey de Ruthyn respecting an estate, and the latter being charged with the delivery of a summons to Owen from Henry, to attend him on his Scottish expedition, purposely neglected to deliver it. Glendower was outlawed for disaffection, and his enemy seized upon his lands. Glendower dispossessed Grey of his lands, and, having raised a considerable force, caused himself to be proclaimed Prince of Wales, September 20, 1400. He defeated the king's troops, retired to the mountains, and foiled all subsequent attempts to bring him to action. He afterwards joined the coalition of the Percies against Henry, and was crowned 'sovereign of Wales.' Glendower arrived with his force too late for the battle of Shrewsbury; and, seeing all was lost, retreated, and continued his marauding warfare. This he kept up with various success, occasionally assisted by Charles VI of France. Finding it impossible to subdue him, Henry V, in 1415, condescended to treat with him; but Owen died during the negotiation.

Glenlivet (glen-liv'et), a valley or district of Scotland in the county of Banff. Whiskey of a particularly fine flavor has long been made in the district. In Glenlivet the Protestant army, under the Earl of Argyle, was defeated by a Roman Catholic force under the Earl of Huntly, in 1594.

Glenroy (glen-roi'), a deep valley in the Highlands of Scotland, parallel to Glenmore (the Great Glen), in Lochaber, Inverness-shire. It is nearly 14 miles in length, and little more than ½ mile in breadth, and is celebrated for its so-called *Parallel Roads*, which are three parallel terraces running along either side of the glen. Not only do the lines on the same side run parallel to each other, but on both sides they respectively occupy the same horizontal level. These terraces project at some parts only a few feet from the hillside, and at others widen out so as to be a number of yards in breadth. The lowest terrace is 850 to 862 feet above the sea-level; the middle, 1062 to 1077

feet; and the highest 1144 to 1155 feet. Their origin has been much disputed, but according to Macculloch, Agassiz, Buckland, and Geikie, the roads are shore-lines of fresh-water lakes. As, however, no land-barrier is discoverable in the vicinity, they refer the lake or lakes to the glacial period, holding that glaciers must have descended from Ben Nevis and dammed up the water in Glenroy. As these glaciers did not disappear simultaneously, the surface of the lake had different elevations successively, and thus distinct shore-lines or beaches were formed at different times.

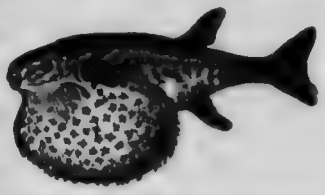
Glens Falls, a town of Warren County, New York, on the Hudson River, 61 miles north of Albany, and with large water-power, the river here falling 50 feet. Shirts and collars, paper and pulp, etc., are made, lime and Portland cement are produced, and fine black marble is quarried. There is here a state armory. Pop. 15,243.

Glenville (glen'vil), a residential section of Cleveland, Ohio, to which it was annexed in 1905. It is on Lake Erie, 4 miles N. E. of the city hall. Pop. (1900) 5588.

Globe (glōb), a sphere, a round solid body, which may be conceived to be generated by the revolution of a semicircle about its diameter. An artificial globe, in geography and astronomy, is a globe of metal, plaster, paper, pasteboard, etc., on the surface of which is drawn a map, or representation of either the earth or the heavens, with the several circles which are conceived upon them, the former being called the *terrestrial globe*, and the latter the *celestial globe*. In the terrestrial globe the wire on which it turns represents the earth's axis, the extremities of it representing the poles. The *brazen meridian* is a vertical circle in which the artificial globe turns, divided into 360 degrees, each degree being divided into minutes and seconds. The brass meridian receives the ends of the axis on which the globe revolves. At right angles to this, and consequently horizontal, is a broad ring of wood or brass representing the horizon; that is, the true horizon of the earth which lies in a plane containing the earth's center. The horizon and brass meridian are connected with the stand on which the whole is supported. On the surface of the globe, as on other maps, are marked parallels of latitude, meridians, etc. On a globe of some size the meridians are drawn through every 15° of the equator, each answering to an hour's difference of time between two places. Hence they are called *hour circles*. A number of *problems* or questions, many of them more curious than useful, may be solved by means of a terrestrial globe. Among the most important ar such as to find the latitude and longitude of a place, the difference of time between two places, the time of the sun's rising and setting for a given day at a given place, etc.

Globe, a city, capital of Gila County, Arizona, 124 miles S. W. of Bowie. Here are rich gold, silver, and copper ores. Pop. 7083.

Globe-fish, the name given to several fishes of the genera *Diōdon* and *Tetraödon*, order Plectognathi, remarkable for possessing the power of suddenly assuming a globular form by swallowing air or water, which, passing into a ventral sac, inflates the whole animal like a balloon.



Pennant's Globe-fish (*Tetraödon lævigātus*).

Globe-flower, a popular name of *Trollius Europæus* (nat. order *Ranunculaceæ*), a common European plant in mountainous regions, having deeply five-lobed serrated leaves and round pale-yellow blossoms, the sepals of which are large and conspicuous, while the petals are very small. It is often cultivated in gardens, and is common in mountain pastures in Great Britain. It is represented in America by only one species.

Globigerina (glō-bi-jer-ī'na), one of the Foraminifera, a microscopical animal having a many-celled shell, found fossil in the chalk and tertiary formations, and still so abundant in our seas that its shells after death form vast calcareous deposits of mud or ooze known as 'globigerina ooze.'

Globulin (glob'ū-lin), a substance forming a considerable proportion of the blood globules, and also occurring, mixed with albumen, in the cells of the crystalline lens of the eye. It resembles albumen.

Glockner (glok'nėr), or GROSS GLOCKNER, a mountain in Austria belonging to the Noric Alps, on the frontiers of the Tyrol, Carinthia, and Salzburg. It is 12,350 feet in height, and takes its name from the resemblance of the principal summit to a large bell.

Glogau (glō'gou), or GROSS-GLOGAU, a Prussian town and fortress in Silesia, on the Oder, 54 miles N. W. of Breslau. It has a Lutheran and a

Catholic gymnasium, some manufactories and a brisk inland trade. Its principal edifices are four churches, one of them formerly having been a cathedral. Pop. (1905) 23,461.

Glommen (glŏm'en), the largest river in Norway, issues from Lake Oresund, about 2417 feet above the sea-level, in the southeast of South Trondhjem, flows generally s., and after a course of above 370 miles falls into the Skagerrack at Frederikstadt.

Gloria (glor'i-a). See *Doxology*.

Gloriosa (glo-ri-ō'sa), a genus of tuberous-rooted, climbing herbs of the nat. order Liliaceæ, so named from the splendid appearance of its flowers. They have branched stems and flowers mostly of a beautiful red and yellow color, with six long, lanceolate, undulated segments, which are entirely reflexed. *G. superba*, a native of India and tropical Africa, is cultivated in hothouses.

Glory Pea, a name given to *Clianthus Dampieri*, a leguminous plant, native of the desert regions of Australia, a low, straggling shrub with light-colored, hairy, pinnate leaves, and large, brilliant scarlet flowers, the standard or banner petal of which appears in the form of an elongated shield with a dark brown boss in the center.

Gloss (glos), an explanation of some verbal difficulty in a literary work, written at the passage to which it refers. The earliest glosses, as those in Greek, Latin, and Hebrew MSS., were interlinear; they were afterwards placed in the margin, and extended finally in some instances to a sort of running commentary on an entire book.

Glossary (glos'a-ri), a limited or partial dictionary, a vocabulary of words used by any author, especially in an old author, or one writing in a provincial dialect, or of words occurring in a special class of works, of the technical terms of any art or science, of a dialect, and the like.

Glossop (glos'up), a municipal borough of England, in Derbyshire, 30 miles from Sheffield. It is the principal seat of the Derbyshire cotton manufacture, and there are also woolen and paper mills, iron foundries, dyeing, bleaching and print works, etc. Pop. 21,526.

Glottis (glot'is), the opening at the upper part of the trachea or windpipe, and between the vocal chords, which, by its dilatation and contraction, contributes to the modulation of the voice. See *Larynx*.

Gloucester (glos'tẽr), a city and river port of England, capital of the county of same name, on the left bank of the Severn, here divided into two channels inclosing the Isle of Alney and crossed by two fine bridges, 33 miles north by east of Bristol, and 95 miles west by north of London. It carries on a considerable shipping trade, the Gloucester and Berkeley canal giving access to the docks. The most remarkable public edifice is the cathedral; it was originally the church of a Benedictine abbey, dating from 1058, and was converted into a cathedral at the Reformation. It exhibits a great variety of styles, the choir, with its roof of fan-tracery being a fine example of Perpendicular Gothic. Other buildings are several handsome old churches, the shire hall, the guildhall, the bishop's palace, county schools of art and science, etc. The schools include the collegiate school founded by Henry VIII, the theological college, the blue-coat school founded in 1666 (and now known as Sir Thomas Rich's school), and the grammar-school of St. Mary de Crypt, founded in the time of Henry VIII. The industries are rather varied, including iron and shipbuilding works, manufactures of cutlery, chemicals, soap, matches, and various others. Pop. 50,029. The county of Gloucester or Gloucestershire borders on the west on the estuary of the Severn, and has an area of 1237 sq. miles. The county is naturally divided into three distinct districts, the Hill or Cotswold in the E.; the Severn Valley in the middle; and the Forest of Dean in the W. The principal rivers are the Severn, with its affluents the Wye, the Leden, and Lower and Upper Avon; and the Isis or Thames, with its affluents the Colne, Churnet, and Windrush. Iron and coal are plentiful and lead ore is found. Limestone and freestone are also met with. Agriculture is in a flourishin state, especially in the vale districts of the county. Gloucester is, however, much more of a dairy than an agricultural county. The celebrated cheese, known as double and single Gloucester, is produced chiefly in the Vale of Berkeley. Orchards are numerous, from the produce of which large quantities of cider are made. Gloucester is a considerable manufacturing county, and has been long famous for its fine broadcloths. Pop. (1911) 672,581.

Gloucester, a city and port of Essex County, Massachusetts, near the extremity of Cape Ann, 28 miles N. N. E. of Boston. It is a popular summer resort, and fisheries and granite quarrying are the chief industries. The

fishery interests are the largest of any place in the United States, and there is a large foreign import trade. It was founded in 1623, chiefly by settlers from Gloucester, England. Here is the oldest Universalist Church in the United States, founded in 1770. About two miles distant is Norman's Woe, the scene of the wreck of the 'Hesperus,' celebrated by Longfellow. Pop. 24,398.

Gloucester, a city of Camden County, New Jersey, on the Delaware River, 5 miles S. of Philadelphia, with which it is connected by ferry. It has manufactures of Welsbach mantles, rugs, etc.; an immigrant detention station; and a shipbuilding plant in the vicinity. Pop. 10,060.

Gloucester, Robert of, a monk of the abbey of Gloucester, flourished in the latter half of the thirteenth century; wrote a chronicle of England extending from the siege of Troy to the year 1270.

Glover, Richard, an English poet, born 1712; died 1785. Though engaged in mercantile pursuits, he devoted much of his attention to literature, and secured a high reputation as a scholar and poet. In 1760 he entered parliament, where his abilities gained him considerable influence. He was the author of two epics, *Leonidas* and the *Atheniad; London, or the Progress of Commerce;* two tragedies, *Boadicea and Medea,* etc.

Gloversville (gluv'ers-vil), a city of Fulton County, New York, 44 miles N. W. of Albany. It is largely engaged in the manufacture of gloves (whence its name); also of glove- and shoe-leather. Pop. 20,642.

Gloves (gluvs) are coverings for the hand, or for the hand and wrist, with a separate sheath for each finger. They are made of leather, fur, cloth, silk, linen thread, cotton, worsted, etc. The chief leathers used in glove manufacture are doe, buck, and calf-skins; sheepskin for military gloves; lambskin for much of the so-called kid gloves; true kid for the best and finest gloves; dog, rat, and kangaroo skins, etc. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Leather gloves are usually cut out by means of dies, and sewed by a machine of peculiar construction. The best woolen, thread, and silk gloves are made by cutting and sewing, but commoner gloves are made by knitting and weaving. Gloversville, in New York, is the chief American seat of the manufacture. In England leather gloves are manufactured at London, Worcester, and elsewhere. Limerick was formerly celebrated for gloves of a peculiarly delicate kind. Italy, Belgium, Sweden, Denmark, and Germany all manufacture excellent gloves, but France supplies the world with most of the finer and more expensive kinds. Gloves are a very ancient article of dress, and many curious customs and usages are connected with them. Throwing the glove down before a person amounted to a challenge to single combat. The judges in England used to be prohibited wearing gloves on the bench; and it was only in case of a maiden assize that the sheriffs were allowed to present a judge with a pair of gloves.

Glowworm (glō'wurm), an insect of the genus *Lampyris* (*L. noctiluca*), of the order Coleoptera, or beetles, the name being strictly applicable only to the female, which is without wings, somewhat resembles a caterpillar, and emits a shining green light from the extremity of the abdomen. The

Glowworm (*Lampyris noctiluca*).

1, Male. 2, Female, upper side. 3, Female, under side, showing the three posterior segments (a) from which the light proceeds.

male is winged, and flies about in the evening, when it is attracted by the light of the female, but gives out no light itself. It would seem that the glowworm possesses the power of moderating or increasing the light at will. Decapitated specimens retain their power of giving out light for a considerable time. In pure oxygen, warm water, or when crushed, the light of the luminous organs is increased in intensity. The larvæ are very voracious, living on snails, which they attack and kill.

Gloxinias.

Gloxinia (gloks-in'i-a), a genus of plants, nat. order Gesneraceæ, distinguished by the corolla approaching to bell-shaped, the upper lip shortest and two-lobed, the lower three-lobed, with the middle lobe largest, and

also by the summit of the style being rounded and hollowed. The species are natives of tropical America. They are valued as among the greatest ornaments of our gardens, owing to their richly colored leaves and their ample, graceful, delicately tinted flowers.

Gluchov, or GLOUKHOV (glö'hov), a town of Russia, government of, and 148 miles east by north from, Tchernigov. Pop. 14,856.

Glucic Acid (glū'sik; or GLUCINIC, $C_{12}H_{12}O_7$). an acid produced by the action of alkalies or acids on sugar. It is a colorless, amorphous substance, is very soluble in water, attracts rapidly the moisture of the air, and its solution has a decidedly sour taste. All its neutrally reacting salts are soluble.

Glucina (glū-si'na), the only oxide of the metal glucinum or beryllium. It is white, tasteless, without odor, and quite insoluble in water, but soluble in the liquid fixed alkalies.

Gluci'num. Same as *Beryllium*.

Gluck (gluk), ALMA, American soprano, born at Bucharest, Roumania, in 1886, was brought to America when she was three years old. She began her vocal studies with Buzzi-Peccia in New York in 1906, and made her operatic début in the Metropolitan Opera House in November, 1909. She gained first rank in grand opera and later became a prime favorite on the concert stage. In 1914 she married Efrem Zimbalist, the celebrated violinist.

Gluck (gluk), CHRISTOPH WILIBALD, a German musical composer, born in Bavaria in 1714; died in Vienna, 1787. When a boy he became a chorister, and acquired some skill on the harpsichord and organ. He came under the patronage of Prince Lobkowitz and Prince Melzi, who placed him under the tutelage of the famous organist and composer, Sammartini, in Milan. His first opera was *Artaserse*, produced at Milan in 1741, and he wrote eight other operas within five years. Invited to London he produced *La Caduta de' Giganti* (*The Fall of the Giants*), which was not a success and was withdrawn after a few performances, despite the fact that it set forth the victories of the Duke of Cumberland. Another opera, *Artamene*, written earlier, met with favor.

In London Gluck became deeply impressed with the majestic character of Handel's airs and choruses, and with the simple but natural dramatic style of Dr. Arne. This visit to London, and a short trip to Paris, helped to develop that lyric genius which was destined to create a new order of musical composition. After producing many pieces of the usual class of opera at Paris, Vienna, Rome, and Naples, he returned to Vienna. The *Trionfo di Clelia* (1762) was the last of his operas in his first style. However well pleased the public was with his music, he was not so. He felt himself continually cramped by the character of the libretti of Metastasio, who had hitherto furnished him with texts, which were rather lyrical dramatic poems than genuine dramas. The composer at last found a poet in the person of Raniero Calzabigi, who sympathized with him in his ideas, and the result of their co-operation was the *Orfeo ed Euridice*, performed publicly for the first time in 1762. This opera marked a new era. The fame it acquired at once it never lost. Various works of lighter character filled up the interval between this year and 1766, when his second great opera of *Alceste* was produced, which raised public feeling to the point of enthusiasm. In his dedication of this work to the Grand-duke Leopold of Tuscany he enunciates the principles of the new school, which shortly were that the opera should be a musical drama, not a concert in costume; that the text must be descriptive of real passion; that the music must voice fully the spirit of the text; that in accompaniments the instruments must be used to strengthen the expression of the vocal parts by their peculiar characters, or to heighten the general dramatic effect by employing them in contrast to the voice. Gluck now became convinced that his system must be tested on a wider field, and believed that the Royal Opera in Paris offered all a composer could demand. A Frenchman of culture and genius, Bailly du Rollet, adapted Racine's *Iphigénie en Aulide* for musical treatment, and after a considerable amount of opposition from the musical critics of the old Italian and French school, at that time represented in Paris by Piccini, the piece was brought out in 1774. The intensest excitement prevailed; all Paris took sides, and for a long time the Gluckists and Piccinists contended with much bitterness, but ultimately the victory remained with the Gluckists. Shortly after the production of the *Iphigénie*, the *Orfeo* was adapted for and put on the French stage, and was followed by the *Armide* in 1777, and by the *Iphigénie en Tauride* in 1779. Gluck's last important work, and by many considered his greatest. It ends the series of works which gave a direction to the operatic genius of Méhul and Cherubini

in France, and of Mozart and Beethoven in Germany.

Glückstadt (glük'stät), a town of Prussia, in Holstein, on the Elbe, 28 miles N. W. of Hamburg. Formerly important as a fortress, it is now a sort of sub-port to Hamburg. Fishing is carried on to a considerable extent. Pop. 6586.

Glucose (glö'kōs; $C_6H_{12}O_6$), a variety of sugar, less sweet than cane-sugar, existing in grapes, and produced from cane-sugar, starch, dextrin, cellulose, etc., by the action of acids, certain ferments, and other reagents. There are two varieties of it, distinguished by their action on polarized light, viz., *dextroglucose* which turns the plane of polarization to the right; and *lævoglucose*, which turns it to the left. When heated up to 400° it becomes caramel, and is used by cooks and confectioners as a coloring matter. It is called also *Grape-sugar* and *Starch-sugar*, and is produced both in the solid and in the liquid form, its manufacture being now of considerable importance. In the United States the liquid sugar, as prepared from Indian corn starch, is what is generally known as glucose, and it is used for various purposes, as for confectionery, canning fruits, making artificial honey for table syrup, in brewing, etc.

Glucosides (glö'kō-sīdz), a large class of substances occurring in animal or vegetable products, possessing the common property of yielding glucose and other products when they are boiled with dilute acids, or are acted on by certain ferments.

Glue (glö), a gelatinous substance obtained from different tissues of animals, and used as a cement for uniting pieces of wood or other material. The best quality is obtained from fresh bones, freed from fat by previous boiling, the clippings and parings of ox-hides, the older skins being preferred; but large quantities are also got from the skins of sheep, calves, cows, hares, dogs, cats, etc., from the refuse of tanneries and tanning works, from old gloves, from sinews, tendons, and other offal of animal origin. By a process of cleaning and boiling the albuminoid elements of the animal matter are changed into gelatine. This in a soft, jelly-like state constitutes *size;* dried into hard, brittle, glassy cakes, which before use must be melted in hot water, it forms the well-known glue of the joiner, etc. When a solution is mixed with acetic or nitric acid it remains liquid, but still retains its power of cementing; in this state it is called *liquid glue*. *Marine Glue* is a cement made by dissolving India rubber in oil of turpentine or coal-naphtha, to which an equal quantity of shellac is added.

Glume (glöm), in botany the imbricate scale-like bract inserted on the axis of the spikelet in Gramineæ (grasses) and Cyperaceæ (sedges). The glume forms the husk or chaff of grain, called also the *palea* or *pale*.

Gluten (glö'tun), a tough, elastic substance of a grayish color, which becomes brown and brittle by drying, found in the flour of wheat and other grain. It contributes much to the nutritive quality of flour, and gives tenacity to its paste. A similar substance is found in the juices of certain plants.

Glutton (glut'on), the *Gulo Arctious*, a carnivorous quadruped, about the size of a large badger, and intermediate between the bear family (Ursidæ) and the weasels (Mustelidæ), resembling the former family in general structure and the latter in dentition. It inhabits Northern Europe and America, and is known also by the name of *Wolverene* or *Wolverine*. The glutton is slow and deficient in agility, but persevering, cunning, fierce, and of great strength. It prefers putrid flesh, and has an extremely fetid odor. The fur is valuable, that from Siberia being preferred from its being of a glossy black. The animal receives its name from its voracity, which, however, has been greatly exaggerated.

Glycerine (glis'ėr-in; $C_3H_8O_3$), a transparent colorless liquid, chemically described as a triatomic or trihydric alcohol, obtained from the by-products of candle and soap factories by saponification with alkalies or by the action of superheated steam. It has a sp. gr. 1.267, and sometimes solidifies at a low temperature to a crystalline mass. It absorbs moisture from the air, and dissolves in or mixes with water and alcohol in all proportions, but is insoluble in ether. It acts as a solvent both on inorganic and organic bodies. The uses of glycerine are very numerous. Its applications in pharmacy are almost endless; as an external application in chaps, rough skin, chafing, etc., it is much used. Internally it is frequently prescribed in combination with iron, and also as a substitute for cod-liver oil, and in cases of diabetes. In the arts it is used wherever a substance requires to be kept more or less moist, for example, modeling clay, tobacco, paper for printing, etc.; also in spinning, weaving, ropemaking and tanning. It is an excellent preservative medium for meat, and for natural history specimens; and its property of lowering

the freezing-point of water makes it useful in gas-meters, floating-compasses and the like. It is also the starting-point of certain valuable chemical products, one of the chief of which is nitroglycerine.

Glycogen (gli'kō-jin), in organic chemistry and physiology, a proximate non-nitrogenous principle occurring in the epithelial cells of the liver, where it exists as an amorphous matter. In properties it seems to be intermediate between starch and dextrine, and in contact with saliva, pancreatic juice, diastase, or with the blood or parenchyma of the liver, it is converted into glucose.

Glycol (gli'kōl or kol; $C_2H_6O_2$), the type of a class of artificial compounds intermediate in their properties and chemical relations between alcohol and glycerine, or the bodies of which these are the types. Otherwise expressed, glycol is a diatomic acid, alcohol being a monatomic and glycerine a triatomic. It is liquid, inodorous, of a sweetish taste, and insoluble in water and alcohol.

Glycon (gli'kon), an Athenian sculptor known by his colossal marble statue of Heracles, commonly called the 'Farnese Hercules,' now in the museum at Naples. He probably lived in the first century B. C.

Glycyrrhiza (gli-si-ri'za), a genus of leguminous plants, of which *G. glabra*, the liquorice plant, is the type.

Glyptodon (glip'to-don; Gr. *glyptos*, engraved, and *odous*, tooth—so named from its fluted teeth), a gigantic fossil edentate animal, closely allied to the armadilloes, found in

Glyptodon (*Glyptodon clavipes*).

the upper Tertiary strata of South America. It was of the size of an ox, and was protected by a coat of mail formed of polygonal osseous plates united by sutures.

Glyptosaurus (glip-to-sa'rus), a genus of fossil land lizards, found in 1871 in the Tertiary beds of Wyoming, and so named from the fact that the head and parts of the body were covered with highly ornamented bony plates (Gr. *glyptos*, engraved). Four species were discovered, the largest about four feet long.

Gmelin (gmel'in), Johann Georg, a German naturalist, born in Tübingen in 1709; died 1755. On taking his medical degree he went to St. Petersburg, and became professor of chemistry and natural history. In 1733, at the expense of the Empress of Russia, he took part in an exploring expedition to Siberia, returning to St. Petersburg in 1743, where he published his *Flora of Siberia*. He became professor of botany and chemistry at Tübingen in 1749, and published *Travels in Siberia* (1752). —His nephew, Samuel Gottlieb, botanist and traveler, was born in 1744, at Tübingen, where he studied physic, and in 1763, took the degree of doctor of medicine. He obtained a professorship of botany at St. Petersburg about 1766, and published a *Historia Fucorum*, 1768. He traveled in Asia, and being imprisoned by the Khan of the Chaitaks, he died in confinement in 1774. His *Travels* appeared in 1770-84.—Another nephew, Johann Friedrich, was born 1748, died 1804. He was professor of medical science at Göttingen for about thirty years; published a *Dictionary of Botany*, and a *History of Natural Sciences*, and edited an edition of Linnæus.

Gmelina (gmel-i'na), an Asiatic genus of plants belonging to the order Verbenaceæ. All the species form shrubs or trees, some of the latter affording very valuable timber.

Gmünd (gmünt), a town of Würtemberg, on the Rems, 28 miles E. N. E. of Stuttgart, formerly an imperial free city. It has three churches of great antiquity, and an extensive museum of industrial products. The manufactures are chiefly woolen and cotton goods, jewelry, and trinkets. Pop. 18,700.

Gmunden ('gmun'dĕn), a town of Upper Austria, situated among magnificent scenery, on the Traun, where it issues from the northern extremity of the lake of that name, 35 miles southwest of Linz. Most of the inhabitants are employed in the neighboring salt-mines. Gmunden is a favorite health-resort and summer residence. Pop. with suburbs 7126.

Gnaphalium (na-pha'li-um), a genus of widely-spread composite plants having their foliage usually covered with a white wooly down, and their flower-heads of the 'everlasting' kind. *G. Leontopodium* is the *edelweiss* of the Alps (which see). *G. polycephalum* is the cotton-weed, common in the United States.

Gnat (nat), the name applied to several species of insects of the genus *Culex*. The common gnat (*C.*

pipiens), type of the sub-family Culicidæ, is of wide geographical distribution, and is noted for its power of inflicting irritating wounds. The proboscis or sting of the female is a tube containing four spiculæ of exquisite fineness, dentated or edged; these are modified mandibles and maxillæ. The males do not sting, and are further distinguished by their plume-like antennæ. These insects also feed on the juice of plants. The female deposits her eggs on the surface of stagnant water in a long mass. After having remained in the larval state for about twenty days, they are transformed into chrysalids, in which all the limbs of the perfect insect are distinguishable, through the diaphanous robe with which they are then shrouded. After remaining three or four days wrapped up in this manner, they become perfect insects. The troublesome mosquito belongs to the same genus.

Gneisenau (gnī'zn-ou), AUGUST WILHELM ANTON, COUNT NEIDTHARD VON, a Prussian general, born in 1760; died 1831. He served with the German auxiliaries of England in America; and as chief of Blücher's staff chiefly directed the strategy of the Prussian army at Waterloo. He was made field-marshal in 1831.

Gneiss (nis), a species of rock, composed of quartz, felspar, and mica, arranged in layers. The layers, whether straight or curved, are frequently thick, but often vary considerably in the same specimen. Gneiss passes on one side into granite, from which it differs in its foliated structure, and on the other into mica slate. It is rich in metallic ores, gold, silver, cobalt, antimony, copper, iron, etc., occurring in this rock, but it contains no fossil remains. Porphyritic gneiss presents large distinct crystals of felspar which traverse several of the foliated layers. Gneiss often contains hornblende in place of mica, and then receives the name of syenitic gneiss. The only difference between this rock and granite consists in the foliation of gneiss, the materials of granite being crystallized promiscuously, those of gneiss being segregated in layers. It is the principal rock of very extensive districts; it predominates in Norway, and all the north of Europe. It abounds in the Southern Alps and the Pyrenees, and forms the loftiest chains of the Andes of Quito. In the United States, also, gneiss is a common rock, especially in New England and the eastern and southern parts of New York.

Gneist (gnīst), HEINRICH RUDOLF HERMANN FRIEDRICH, a German jurist, born at Berlin in 1816 and studied at the university there, in which, in 1844, he became professor-extraordinary, and in 1858 ordinary professor. He likewise took part in politics as a member of the Prussian House of Deputies, and of the diet of the German Empire, ranging himself on the liberal side. He wrote extensively on law, constitutional history, etc., and had a specially thorough knowledge of English constitutional history, his *History of the English Constitution* having been translated and published in England in 1886. He died in 1895.

Gnesen (gnā'zn), a town of Prussia, province of Posen, 45 miles southwest of Bromberg. It is an ancient place; is the see of an archbishop, and has a cathedral, in which the kings of Poland used to be crowned. Pop. 23,727.

Gnome (nōm; Greek, *gnō'mē*), a short, pithy saying, often expressed in figurative language, containing a reflection, a practical observation, or a moral maxim. Among the Greeks Theognis, Phocylides, and others are called the *Gnomic poets*, from their sententious manner of writing.

Gnome (nōm), in the cabalistic and mediæval mythology, the name given to the spirits which dwell in the interior of the earth, where they watch over mines, quarries, and hidden treasures. They assume a variety of forms, but are generally grotesque dwarfs, ugliness being their appropriate quality, though the females, *gnomides*, are originally beautiful.

Gnomon (nō'mon), the style of a dial, or a structure erected perpendicularly to the horizon, from whose shadow the altitudes, declinations, etc., of the sun and stars may be determined. The gnomon is usually a pillar or column or pyramid erected upon level ground. It was much used by the ancient astronomers, and gnomons of great height, with meridian lines attached to them, are still common in France and Italy.

Gnomonics (nō-mon'iks), the art and theory of making sun-dials on true scientific principles.

Gnostics (nos'tiks; Greek, *gnosis*, knowledge), a general name applied to early schools of philosophical speculators, which combined the fantastic notions of the oriental systems of religion with the ideas of the Greek philosophers and the doctrines of Christianity. They nearly all agreed on the points that God is incomprehensible; that matter is eternal and antagonistic to God; that creation is the work of the

Demiurge, an emanation from the Supreme Deity, subordinate or opposed to God; and that the human nature of Christ was a mere deceptive appearance. Certain forms of Gnosticism are mere adaptations of the Persian dualism to the solution of the problem of good and evil; while the pantheism of India seems to have been a pervading influence in others. Simon the magician (Simon Magus), of whom Luke speaks in the *Acts of the Apostles*, is generally looked on as the first of the Gnostics. The dogmas of the earliest Gnostics may be reduced to the following heads:—God, the highest intelligence, dwells at an infinite distance from this world, in the Abyss, removed from all connection with every work of temporal creation. He is the source of all good; matter, the crude, chaotic mass of which all things were made, is, like God, eternal, and is the source of all evil. From these two principles, before time commenced, emanated beings called *æons*, which are described as divine spirits, inhabiting the Pleröma, or plenitude of light, which surrounds the Abyss. The world and the human race were created out of matter by one æon, the Demiurge, or, according to the later systems of the Gnostics, by several æons and angels. The æons made the bodies and the sensual soul of man of this matter; hence the origin of evil in man. God gave man the rational soul; hence the constant struggle of reason with sense. What are called gods by men (for instance, Jehovah, the God of the Jews) are merely such æons or creators, under whose dominion man became more and more wicked and miserable. To destroy the power of these creators, and to free man from the power of matter, God sent the most exalted of all æons, to which character Simon first made pretensions. The Nicolaitans mentioned in the *Revelation of St. John*, so called from Nicolas, a deacon of the church at Jerusalem, were one of the earliest sects, and are described as forerunners of the Cerinthians. Cerinthus, a Jew, of whom John the evangelist seems to have had some knowledge, combined such reveries with the doctrines of Christianity, and maintained that the most elevated æon sent by God for the salvation of man, was Christ, who had descended upon Jesus, a Jew, in the form of a dove, and through him revealed the doctrines of Christianity, but before the crucifixion of Jesus separated from him, and at the resurrection of the dead will again be united with him, and lay the foundation of a kingdom of the most perfect earthly felicity, to continue 1000 years. Carpocrates and the sect of the Ophites (beginning of the second century), to whom the term Gnostic was first applied, saw in the Serpent a wise and good being, and carried to its extreme form the inversion of the Biblical story. The later Gnostics have been divided into three schools. The first was the Syrian, founded by Menander, a pupil of Simon. This school emphasizes the conflict between Good and Evil—the Supreme Deity on the one hand, and the Demiurge and his angels or æons on the other. The second was the school of Alexandria, represented by Basilides and Valentinus; the system of the latter being the most complete and ingenious of all. In that light or plenitude, which all the Gnostics speak of as surrounding the residence of the Supreme God, he has placed fifteen male and as many female æons. The Supreme God, the Unbegotten, the Original Father, whom he also calls the *Deep* (Bathos), is the first of these æons; Thinking Silence was his wife, and Intelligence, a male, and Truth, a female, were their children. These produced The Word and Life, the latter a female, who gave birth to mankind and society. These eight constituted the first class of the thirty æons. The second class, of five couples, at the end of which stood the Only Begotten, and the third, of six couples, at the head of which stood the Comforter, were, in a similar manner, descended from Mankind and Society, and whom all the æons of the kingdom of the other æons in their duties; and Jesus, consisted, like the first, of personified ideas. The officers of this heavenly state are four male æons—Horus, who guards the boundaries of the region of light; Christ and the Holy Ghost, who instruct light begat in common, and endowed with their gifts. Man and the world were formed by a demiurge out of matter which was partly material, partly spiritual, partly soul-like. Christ, the Saviour of men, when he appeared on earth had a visible body made of the spiritual and the soul-like substance only. At his baptism the æon Jesus united itself with him, and instructed mankind. A third school of Gnosticism, whose center was Asia Minor, was represented by Marcion of Pontus, the son of a Christian bishop, who flourished about the middle of the second century. Marcion assigned to Christianity, as the one absolutely independent religion, a complete isolation from the Old Testament revelation, the author of which was, in his opinion, merely a just but not a good being. The true God begat many spirits, among which were the creator of the world, the righteous God, and the lawgiver of the

Jews. The last, through the prophets, promised Christ; but Jesus, who actually appeared, and is the true Redeemer, was the Son of the truly good God, and not the Jewish Messiah. Towards the end of the second century Tatian, a Syrian Christian, adopted Gnostic doctrines, and founded a sect. Bardesanes, a Syrian, and Hermogenes, an African, who, in the reign of the Emperor Commodus, apostatized from Christianity, and established sects, bordered, in their hypotheses concerning the origin of good and evil, upon Gnosticism. There have been no Gnostic sects since the fifth century; but many of the principles of their system of emanations reappear in later philosophical systems, drawn from the same sources as theirs.

Gnu (nö), the *Wildebeeste* ('wild beast') of the colonists, the name given to two species of South African antelope (*Catoblĕphas gnu*, and *C. gorgon*). The former species is now rarely found south of the Vaal; its form partakes of that of the antelope, ox, or horse. Both sexes have horns projecting slightly outwards and downwards, then forming an abrupt upward bend. They have bristly black hair about the face and muzzle, a white, stiff mane, and horse-like tail. They attain a length of about nine feet, and stand about four feet high at the shoulder. They live in herds; are said to be fierce when attacked, but when taken young have been found to be capable of domestication. The brindled gnu (*C. gorgon*) is larger than the common gnu, has black stripes on the neck and shoulders, and a black tail. Both species wheel in a circle once or twice before setting off when alarmed.

Goa (gō'a), a city in Hindustan, on the Malabar coast, capital of the Portuguese territory of the same name. The name is applied to two distinct places, namely, Old Goa, and New Goa or Panjim. The former was once the chief emporium of commerce between the East and West, and had a population of 200,000, but it is now nearly deserted, though some pains are taken to keep the ancient churches and convents in repair; pop. less than 2000. New Goa or Panjim was chosen as the residence of the Portuguese viceroy in 1759; and in 1843 it was made the capital of Portuguese India. It is situated on the left bank of the Mandavi, about 3 miles from its mouth, contains many fine public buildings, cathedral, viceregal palace, etc. The trade of Goa, at one time the most extensive of any place in India, is now inconsiderable. Pop. 8440. The territory around Goa belonging to the Portuguese has an area of 1062 sq. miles. It is well watered and fertile. About two-thirds of the total population, numbering about 475,000, are the descendants of Hindus converted to Christianity on the subjugation of the country by the Portuguese.

Goalanda (gō-ä-län'dä), a river mart and municipality of Bengal, at the confluence of the main streams of the Ganges and Brahmaputra. Pop. 8052.

Goalpara (gō-äl-pä'rä), a district of British India, prov. of Assam; area 3897 sq. miles; pop. about 450,000. It lies on both sides of the Brahmaputra, and is exposed to river floods. Rice is the staple crop; and brass and iron utensils, gold and silver ornaments, etc., of an artistic character are manufactured. Goalpara Town is the chief center of trade. Pop. 6287.

Goa Powder (gō'a), a powder used in the treatment of certain skin diseases, obtained from the pith of a leguminous tree, a species of *Centrolobium*, and called also Araroba Powder.

Goat (gōt), a well-known horned ruminant quadruped of the genus *Capra*. The horns are hollow, erect, turned backward, annular on the surface and scabrous. The male is generally bearded under the chin. Goats are nearly of the size of sheep, but stronger, less timid, and more agile. They frequent

Goat of Cashmere.

rocks and mountains, and subsist on scanty, coarse food. Their milk is sweet, nourishing, and medicinal, and their flesh furnishes food. Goats are of almost interminable variety, and it is not certainly known from which the domestic goat is descended, though opinion favors the *C. ægagrus*, or wild goat of Western Asia. Goats are generally subdivided into ibexes and goats proper. They are found in all parts of the world, and many

varieties are valued for their hair or wool. The skin is prepared for a variety of purposes, and yields the leather well known under the name of *morocco*. The Cashmere goat, as its name indicates, is a native of Cashmere; it is smaller than the common domestic goat, and has long, silky, fine hair. The Angora goat is also furnished with soft silky hair of a silver-white color, hanging down in curling locks 8 or 9 inches long. Its horns are in a spiral form, and extend laterally. The Rocky Mountain goat is the *Haplocĕrus montānus*, or big-horn (which see).

Goat Island, a small island of 70 acres, which divides the current of the Niagara River at the Falls. It is connected with the American shore by a bridge.

Goat-moth, a large British moth (*Cossus ligniperda*). The larvæ, which are about 3 inches in length, hollow out galleries in the wood of trees, which they first soften by a juice of a strong smell which they secrete. With the sawdust made in the operation they form cocoons, in which the chrysalids are developed. The larval condition lasts for three years. *C. robiniæ*, the locust-tree carpenter-moth, an American species, expands about three inches, and is gray in color.

Goat's-beard, the general name of plants of the genus *Tragopōgon*, order Compositæ, herbaceous perennials, chiefly natives of Europe. The seeds have feathery appendages; hence the name. The purple goat's-beard (*T. porrifolius*) is cultivated for its root as a table vegetable, known as *Salsify*, and called, in the United States, the oyster plant, its flavor somewhat resembling that of the oyster.

Goat's-rue (*Galēga officinālis*), a leguminous plant indigenous to the south of Europe. It is used as a forage, and is supposed to increase the milk of cows that feed upon it. It is found in North America in dry, sandy soil, from Canada to Florida.

Goat's-thorn, a name given to two hardy, evergreen plants of the genus *Astragălus*. *A. Tragacantha* (great goat's-thorn), and *A. Poterium* (small goat's-thorn). The former, long cultivated in Great Britain, is a native of the south of Europe, the latter of the Levant. There is an American species, *A. Canadensis*.

Goatsucker, a name common to the birds of the genus *Caprimulgus*, as also to all belonging to the same family—the Caprimulgidæ, given originally from the erroneous opinion that they suck goats. The European goatsucker (*C. Europæus*) feeds upon nocturnal insects, as moths, gnats, beetles, etc., which it catches on the wing, flying with its mouth open. Its mouth is comparatively large, and lined on the inside with a glutinous substance to prevent the escape of those insects which fly into it. Like all birds which catch flies when on the wing, the gape is surrounded by stiff bristles. When perched, it usually sits lengthwise on a bare twig, with its head lower than its tail, and in this attitude utters a jarring note, whence one of its common names—*night-jar*, or *night-churr*. It has a light, soft plumage, minutely mottled with gray and brown, and is about 10 inches in length. The American chuckwill's widow, whip-poor-will, and night-hawk belong to the same family.

Gobelins Manufactory (gob-lan), a tapestry manufactory at Paris, established by Colbert in 1667, on the site of a previously existing manufactory which had been set up by Gilles Gobelin, a celebrated dyer in the reign of Francis I. Colbert collected into it the ablest workmen in the divers arts and manufactures connected with house decoration and upholstery. The Gobelins has since then continued to be the first manufactory of the kind in the world. Many celebrated paintings of the old Italian, French, and Spanish schools have, in the most ingenious manner, been transferred to tapestry.

Gobi (gō'bē), Desert of, the *Shamo* or 'sand-sea' of the Chinese, an immense tract of desert country, occupying nearly the center of the high tableland of Eastern Asia, between lat. 35° and 45° N., and lon. 90° and 110° E., and extending over a large portion of Mongolia and Chinese Turkestan. Its extreme length is probably about 1800 miles; mean breadth, between 350 and 400 miles; area, 300,000 sq. miles. Its general elevation is over 4000 feet above the sea-level. The East Gobi is occupied by different tribes of the Mongolian race, who have numerous herds of camels, horses, and sheep. In the West Gobi are some nomadic tribes of the Tatar race. This tract is suppose at one time to have been a great inland sea.

Goblin (gob'lin), a spirit of popular superstition, generally malignant in nature and grotesque in appearance; much the same as a gnome.

Goby (gō'bi), the general name of a family of acanthopterous fishes (Gobiidæ) characterized as follows:—Two dorsal fins nearly united into one, the anterior fin having flexible rays, not spinous, as is usual in the Acanthopterygians; ventral fins thoracic, and united

more or less by their bases; body scaly, the head unarmed. Like the blennies, they can live for some time out of water. The family is very numerous, about 400 species being known, but does not include any important food fishes. The gobies are among the nest-building fishes, and live among the rocks near the shore.

God, the self-existent, eternal, and Supreme Being, the creator and upholder of the universe, worshiped by most civilized nations. The Christian God is held to be an infinite and absolute being; a perfect personal spirit; eternal; immutable; omniscient; omnipotent; and perfectly good, true, and righteous. The arguments for the existence of God have been divided into the ontological, the cosmological, the psychological, the physico-teleological, and the moral. The ontological argument starts from the idea of God itself, and professes to demonstrate the existence of God as a necessary consequence from that idea. This form of argument is, in some shape or other, a very old one, but was first fully developed and applied by Anselm in the 11th century. The manner in which it was stated by Anselm is this: 'God must be thought of as that being than whom none can be thought greater; but this being the highest and most perfect that we can conceive, may be thought as existing in actuality as well as in thought—that is to say, may be thought as something still greater; therefore God, or what is thought as greatest, must exist not only in thought but in fact.' This argument has been presented in other forms. Descartes, while refuting Anselm's form of the ontological argument, revived it himself in another form. Applying the test of truth which he derived from his celebrated formula—'I think, therefore I am,' that whatever we clearly and distinctly perceive to belong to the true and unalterable nature of a thing may be predicated of it, he found on investigating God that existence belongs to his true and unalterable nature, and therefore may legitimately be predicated of him. Another argument was adduced by Descartes to prove the existence of God, which, although not the same with the ontological argument, appears to resemble it. It is called the psychological argument. Like the ontological argument, it starts from the idea of a supreme and perfect being, but it does not assert the objective existence of that being as implied in its idea, but infers such objective existence on the ground that we could have acquired the idea only from the being which corresponds to it. The cosmological argument starts not from an idea, but from a contingent existence, and infers from it an absolutely necessary being as its cause. Stated syllogistically, the argument is: Every new thing and every change in a previously existing thing must have a cause sufficient and pre-existing. The universe consists of a system of changes. Therefore the universe must have a cause exterior and anterior to itself. The argument called the physico-teleological is that which is commonly known as the argument from design, which has been so fully illustrated by Paley in his *Natural Theology*. It is simply this, that in nature there are unmistakable evidences of the adaptation of means to ends, which lead us inevitably to the idea of one that planned this adaptation, that is, of God. The moral argument is derived from the constitution and history of man and his relations to the universe, being based on such considerations as our recognition of good and evil, right and wrong, the monitions of conscience, and the fact that a moral government of the world may be observed. Another argument is based on the (alleged) fact that a belief in the existence of a Supreme Being is everywhere found to be implanted in the breast of man. This argument is used among others by Cicero, and many thinkers are inclined to give a good deal of weight to it; still it is pronounced by others to be at best only a probable argument, if it may be accepted as valid to prove anything at all. Others argue the existence of God from the manifestations which he has made of himself to men, but these, as well as miracles, it is admitted even by Christian theists, can be accepted as real only by such as previously believed in the divine existence.

Godavari (gō-dä'va-rē) a large river of Central India, which rises about 50 miles from the shore of the Indian Ocean, flows across the Deccan from the Western to the Eastern Ghats in a general southeasterly direction, and being joined by several affluents, falls by three principal mouths into the Bay of Bengal, after a course of 900 miles. Before the river divides there are three great obstacles to navigation, caused by three rocky barriers.—GODAVARI is also the name of a British district of the Madras Presidency; area, 7345 sq. miles; pop. 1,791,512. Coringa and Coconada are its chief ports.

Godfrey (god'frē), SIR EDMONDBURY, the magistrate who received the depositions of Titus Oates with regard to the alleged Popish plot, Sept. 28, 1678. He was soon after found dead, pierced with his own sword, though evi-

'ently not by his own hand. His death was imputed to the resentment of the papists, and the excitement aroused was the actual cause of the Popish Plot agitation.

Godfrey of Bouillon, leader of the first crusade, son of Eustace II, count of Boulogne, born near Nivelles, 1061; died at Jerusalem, 1100. He distinguished himself while fighting for the Emperor Henry IV in Germany and Italy, and was made Duke of Bouillon. In order to expiate his sin of fighting against the pope, he took the cross for the Holy Land in 1095, and led 80,000 men to the East by way of Constantinople. On the 1st of May, 1097, they crossed the Bosporus, and began their march on Nice (Nicæa), which they took in June. In July the way to Syria was opened by the victory of Dorylæum (Eski Shehr), in Phrygia, and before the end of 1097 the crusaders encamped before Antioch. The town of Antioch fell into their hands in 1098, and in the following year Godfrey took Jerusalem itself, after a five weeks' siege. The leaders of the army elected him king of the city and the territory; but Godfrey would not wear a crown in the place where Christ was crowned with thorns and contented himself with the title of *duke and guardian of the holy sepulcher*. The defeat of the Egyptians at Ascalon placed him in possession of all th Holy Land, excepting two or three places. Godfrey now turned his attention to the organization of his newly-established government, and promulgated a code of feudal laws called the *Assize of Jerusalem*. Godfrey was a favorite subject of mediæval poetry, and is the central figure of Tasso's *Jerusalem Delivered*.

Godfrey of Strasburg, a German poet, who flourished about 1200, was probably born in Strasburg, but at any rate lived there. Besides many lays, we are indebted to him for the great chivalric poem, *Tristan und Isolde*, derived from the legends of the *Round Table*.

Godiva (go-di'va), the wife of Leofric, earl of Mercia and lord of Coventry in the reign of Edward the Confessor, heroine of a celebrated tradition. In 1040 certain exactions imposed on the inhabitants bore heavily on them, and Godiva interceded for their relief. Leofric, however, only laughed at her, and when she persisted in her entreaties at last said to her, half jocularly, that he would grant her request if she would ride naked through the town of Coventry. Godiva took her husband at his word, proclaimed that on a certain day no one should leave his house before noon, that all windows and other apertures in the houses should be closed, and that no one should even look out until noon was past. She then mounted naked on her palfrey, rode through the town, and returned; and Leofric, in fulfillment of his promise, freed the inhabitants from the burdens he had imposed on them. Only one person, 'Peeping Tom,' the story says, attempted to look out, and he was immediately struck blind. A yearly pageant, in which a young woman enacted the part of Godiva, was long kept up at Coventry, and still occasionally takes place. Tennyson's poem on Godiva is well known.

Godkin (god'kin), EDWIN LAWRENCE, editor, born at Wicklow, Ireland, in 1831; died in New York, 1902. He graduated at Queen's College, Belfast, engaged in journalism and was correspondent of the London *Daily News* during the Crimean war and the American Civil war. He was admitted to the bar in New York in 1858, became editor in 1865 and proprietor in 1866 of *The Nation* and in 1882 of the New York *Evening Post*.

Godna (god'na). See *Revelganj*.

Godolphin (go-dol'fin), SIDNEY, Earl of Godolphin, an English politician, was a native of Cornwall, date of birth unknown, probably 1635. Under Charles II, he was one of those who voted for the exclusion of the Duke of York from the throne in 1680. He nevertheless retained office under that monarch, as he did also under William III, with whom he had long been in correspondence. During the reign of Anne he was appointed lord high-treasurer of England, and in this office did much to improve the public credit, and check corruption in the administration of the public funds. In 1706 he was made Earl of Godolphin, and four years afterwards was obliged to retire from office. His death took place in 1712. He was a man of great business capacity, but his treasonable correspondence with James while he held an office of trust under William of Orange is a serious blot upon his character.

Godoy (go-doi'), MANUEL, Duke of Alcudia, better known as the *Prince of the Peace*, was born at Badajos, Spain, in 1767; died in 1851. He entered the royal body-guards in 1787. His personal qualities soon made him a favorite at the Spanish court, and his promotion was rapid. In 1791 he became adjutant-general of the guards, in 1792 lieutenant-general, Marquis of Alcudia, grandee of Spain of the first class, and prime-minis-

ter; and in 1795, as a reward for the part he had taken in concluding peace with France, he was presented with a large and valuable landed estate, and made a knight of the Golden Fleece. It was on this occasion also that he was named by the king Prince of Peace. As he used his vast power in the promotion of French more than Spanish interests, he became extremely unpopular, and the hatred of the people became so great in 1808 that he had to take refuge in France. Having lost everything, he lived for a long time only on the bounty of his royal friends. In 1847 he was permitted to return to Spain and resume his titles. The larger portion of his domains, however, was irrecoverably lost, and he ended his days in obscurity and poverty.

God Save the King, the burden and common appellation of a well-known English national song. Concerning the author and the composer opinions differ. It has been attributed to Dr. John Bull, chamber musician to James I; his ode, dating from the gu powder plot, beginning 'God save great James our King.' But the composition we now possess would seem to have been, both words and melody, the work of Henry Carey (died 1743). It appears to have been first published, together with the air, in the *Gentleman's Magazine* in 1745, when the landing of the young Stuart called forth expressions of loyalty from the adherents of the reigning family. After Dr. Arne, the composer of another national song (*Rule, Britannia*), had brought it on the stage, it soon became very popular. Since that time the harmony of the song has undoubtedly been improved, but the rhythm is the same as originaliy.

God's Truce, a means adopted by the church in the Middle Ages to check in some measure the hostile spirit of the times, by fixing certain days or periods during which private feuds must cease. This began about the beginning of the eleventh century. The church forbade all feuds from Thursday morning to Monday morning, as these days were consecrated by the death and resurrection of Christ; excommunication being the penalty. Afterwards the whole of Thursday was included, the whole time from the beginning of Advent to the Epiphany, and certain other times of religious import. Hostile encounters were forbidden in the precincts of churches, convents, and graveyards.

Godwin (god'win), Earl of Wessex, an Anglo-Saxon noble, born about 920; died 1052. In 1018 he was created an earl by Canute, and married the king's niece Gytha. During the reign of Edward the Confessor, who married Godwin's daughter, a quarrel arose between Godwin and the king, occasioned by the partiality of Edward for Norman favorites, and Godwin was compelled to quit the kingdom. In 1052, however, he returned with an army, forced Edward to enter into negotiations with him, reestablished himself triumphantly in his old supremacy, and caused the expulsion from the kingdom of most of the Norman intruders. He was the father of Harold, the last Anglo-Saxon king.

Godwin, Mary, also well known by her maiden name of Wollstonecraft, born in or near London in 1759; died 1797. Her early training was very defective, but fitting herself for a teacher, she set up a school, in conjunction with her sisters, at Islington in 1783. In 1786 she published *Thoughts on the Education of Daughters.* This was followed by an answer to Burke's *Reflections on the French Revolution*, the *Vindication of the Rights of Women*, and other works. She had peculiar ideas on marriage, and formed a somewhat loose connection with an American of the name of Imlay, whose desertion caused her to attempt suicide. Some time after she fixed her affection on William Godwin (see next art.). As the bonds of wedlock were deemed a species of slavery in her theory, it was only to legitimize the forthcoming fruits of the union that a marriage between the parties took place. She died in giving birth to a daughter, who afterwards became the wife of Shelley, the poet. Among her other works are a *Moral and Historical View of the French Revolution*, and *Letters from Sweden, Norway, and Denmark.*

Godwin, Parke, journalist, born at Paterson, New Jersey, in 1816; died in 1904. He studied law, but preferred literary pursuits, and for many years was connected with the New York *Evening Post.* He was deputy collector for New York during the Polk administration, edited for a time *The Pathfinder*, and contributed to the *Democratic Review.* He also wrote for and for some time edited *Putnam's Magazine.*

Godwin, William, an English novelist and political writer, son of a Dissenting minister, was born in 1756; died 1836. In 1778 he became the minister of a Dissenting congregation near London, and continued in that capacity for five years, after which he removed to London, where he set himself to gaining his livelihood by literary labors. In 1793 appeared his *Inquiry Concerning Political Justice*, the liberal tone of

which exposed him to some danger of a government prosecution. The next year appeared his novel of *Caleb Williams, or Things as They Are*, which rapidly and deservedly attained an immense popularity. He married Mary Wollstonecraft (see preceding art.). A memoir of his wife was published by Godwin in 1798. In 1799 he published a new novel, *St. Leon*. Among Godwin's subsequent works are: *Faulkner*, a tragedy; *Essay on Sepulchers; Mandeville*, a novel; *A Treatise on Population*, in reply to Malthus; *History of the Commonwealth of England; Cloudesley*, a novel; *Thoughts on Man*, and *Lives of the Necromancers*.

Godwinia (god-win'i-a), a genus of plants of the natural order Araceæ. A gigantic species (*G. gigas*) discovered in Nicaragua produces but one very large and very deeply cut leaf supported on a stalk 10 feet long. The inflorescence appears at a different time from the leaf, and consists of a stalk about 10 inches high supporting the spathe or flower 2 feet long, purplish-blue in color, with a carrion-like odor.

Godwit (god'wit), the common name of the members of a genus of grallatorial birds (*Limôsa*), family Scolopacidæ (snipes). There are several European species, among them the common godwit (*L. melanura*) and the red godwit (*L. rufa*). There are besides the great American godwit, the cinereous godwit, the black-tailed godwit, the red-breasted godwit, etc. The common godwit frequents fens and the banks of rivers, and its flesh is esteemed a great delicacy.

Goes (*hös*), or TERGOES, a fortified town and port in Holland, in province of Zeeland, on the island of South Beveland, 16 miles west of Bergen-op-Zoom. Pop. 6923.

Goethals (gō'thalz), GEORGE WASHINGTON, an American military engineer, born in Brooklyn, New York, June 29, 1858. Graduated at the United States Military Academy and assigned to the corp of engineers in 1880, he became lieutenant-colonel and chief of the volunteer engineers in 1898, and major of the U. S. engineers in 1900. In 1905 he was graduated at the Army War College, and in 1907 became chief engineer of the Panama Canal. President Taft appointed him in 1912 governor of the Canal Zone. He was designated Acting Quartermaster General in December, 1917, by President Wilson during the war.

Goethe (gew'tē), JOHANN WOLFGANG VON, the greatest figure in German literature, was born in 1749, at Frankfort-on-the-Main; died at Weimar in 1831. His father, who was a Doctor of Laws and imperial councilor, was a well-to-do citizen and an admirer of the fine arts. The Seven Years' war broke out when Goethe was eight years old, and Count de Thorane, *lieutenant du roi* of the French army in Germany, was quartered in the house of his father. The count, being an amateur and liberal patron of art, encouraged the boy's incipient taste for pictures. At the same time young Goethe learned the French language practically; and a French theatrical company, then performing at Frankfort, awakened his taste for dramatic performances. Drawing, music, natural science, the elements of jurisprudence, and the languages occupied him in succession. After the breaking off of a youthful love affair, which gave a name to the heroine of his great work *Faust* and some features to his *Wilhelm Meister*, he was sent to the University of Leipzig to prepare himself for the legal profession, but he did not follow any regular course of studies. Goethe began at this period, what he practiced throughout his life, to embody in a poem, or in a poetical form, whatever occupied his mind intensely: and no one, perhaps, was ever more in need of such an exercise, as his nature continually hurried him from one extreme to another. In 1768 he left Leipzig, and after an illness of some length he went in 1770 to the University of Strasburg, to pursue the study of law, according to the wish of his father. At Strasburg he became acquainted with Herder—a decisive circumstances in his life. Herder made him more acquainted with the Italian school of the fine arts, and inspired his mind with views of poetry more congenial to his character than any which he had hitherto conceived. While here he fell in love with Frederica Brion, daughter of the pastor of Sesenheim, but the affair, though it made a more abiding impression on him than some others, resulted in nothing. Goethe's numerous love affairs form one of the most curious studies in biography. His attachments were all fugitive; the love passion was continuous, but the object was ever changing. In 1771 he took the degree of Doctor of Jurisprudence, and wrote a dissertation on a legal subject. He then went to Wetzlar to practice law, where he found, in his own love for a betrothed lady, and in the fate of a young man named Jerusalem, the subjects for his striking work, *The Sorrows of Werther*, which formed an epoch in German literature. The attention of the public had already been attracted to him, however, by his drama *Götz von Ber-*

Berlichingen (published 1773). *Werther* appeared in 1774. Not long after the publication of *Werther*, Charles Augustus, the hereditary duke of Saxe-Weimar, made the acquaintance of Goethe on a journey, and when in 1775 he took the government into his own hands, he invited Goethe to his court. Goethe accepted the invitation, and on the 7th of November, 1775, arrived at Weimar. Wieland was already there, having been the duke's tutor: Herder was added to the band in 1776; Schiller was afterwards one of its members for a few years; and other poets and critics and novelists were gathered round these chiefs. Goethe was the leading spirit of the group even during the last quarter of the eighteenth century, when these men and others were constructing and guiding the literature of all Germany; and his supremacy became yet more absolute afterwards, when for another generation he stood alone. In 1776 he was made privy-councilor of legation, with a seat and vote in the privy-council. In 1782 he was made president of the chamber, and ennobled. In 1786 he made a journey to Italy, where he remained two years, visited Sicily, and remained a long time in Rome. This residence in Italy had the effect of still further developing his artistic powers. Here his *Iphigenia* was matured, *Egmont* finished, and *Tasso* projected. The first of these was published in 1787, the second in 1788, and the third in 1790. In the same year with *Tasso* was published the earliest form of the first part of *Faust*, with the title *Dr. Faust, ein Trauerspiel* ('Dr. Faust, a Tragedy'), a poem in a dramatic form, which belongs rather to Goethe's whole life than to any particular period of it. At the time that Goethe was engaged in the production of these works of imagination he had been pursuing various other studies of a scientific nature with as ardent an interest as if these had belonged to his peculiar province. The result of his studies in botany was a work published also in 1790, *Versuch die Metamorphose der Pflanzen zu Erklären* ('Attempts to Explain the Metamorphosis of Plants'), in which he gives expression to the view that the whole plant, and its different parts, may all be regarded as variously modified leaves. In the following year (1791) he began to apply himself to optics, and in 1791-92 he published a work on this subject called *Beiträge zur Optik*. On the 1st of May, 1791, he became director of the court theater at Weimar. In 1792 he followed his prince during the campaign of the Prussians against the revolutionary party in France, and was present at the battle of Valmy on the 20th of September. At the Weimar theater he brought out some of the dramatic chefs-d'œuvre of Schiller, and there, too, his own dramatic works first appeared, *Götz von Berlichingen*, *Faust*, *Iphigenia at Tauris*, *Tasso*, *Clavigo*, *Stella*, and *Count Egmont*. In 1794-96 Goethe published *Wilhelm Meister's Lehrjahre* ('Wilhelm Meister's Apprenticeship'), a novel which has become well known to English readers through the translation of Carlyle, and which had as a continuation *Wilhelm Meister's Wanderjahre* (th[illegible]s, his travels as a journeyman; 1821). His next work of importance was *Hermann und Dorothea* (1797), a narrative poem, in hexameter verse, the characters of which are taken from humble life. In 1806 Goethe married Christiane Vulpius, with whom he lived since 1788, and of whom he always spoke with warmth and gratitude for the degree in which she had contributed to his domestic happiness. In 1808 he published another edition of *Faust* in a considerably altered form. In 1809 was published *Wahlverwandtschaften* ('Elective Affinities'), another novel, and in 1810 the *Farbenlehre* or 'Theory of Colors,' a work in which he had the boldness to oppose the Newtonian theory, and to which Goethe himself attached great importance, although the theory therein promulgated has met with no acceptance among men of science. In 1811-14 appeared Goethe's autobiography, with the title *Aus meinem Leben: Dichtung und Wahrheit;* in 1819 the *Westöstlicher Divan*, a remarkable collection of oriental songs and poems. Goethe's last work was the second part of *Faust*, which was completed on the evening before the last anniversary of his birthday which he lived to see. Goethe's works taken altogether form a rich constellation of poetry, romance, science, art, and philosophy. His greatest production is his *Faust*, emphatically a philosophical dramatic poem, and the best of Goethe's productions in a department for which he seems to have been born. Much light is thrown on Goethe's life and character by the published correspondence with his contemporaries, Herder, Frau von Stein, Lavater, Jacobi, Merck, Countess Stolberg, etc.; by Eckermann's *Conversations*, and especially by his own *Autobiography*, which he himself describes as 'poetry and truth,' and in which probably the truth is sometimes clouded by the poetry. George Henry Lewes's *Life of Goethe* is a standard work both in Germany and Britain.

Gog and Magog. Ezekiel predicts the destruction of Gog and Magog (ch. xxxviii and

xxxix) by the Jews, and mention is also made of them in *Revelation* (ch. xx). Interpreters generally understand them to be symbolical expressions for the heathen nations of Asia. Magog is mentioned as the second son of Japheth in *Genesis* (ch. x, 2). Gog and Magog are also the names given to two reputed giants of early British history, whose statues are erected in the Guildhall in London. These statues are supposed to have been originally made for carrying about in pageants. The present figures of Gog and Magog, which are 14 ft. high, were erected in 1708.

Gogo (gō'gō), a town in Bombay Presidency, on the peninsula of Kathiawar, on the Gulf of Cambay, 193 miles N. W. of Bombay. Pop. about 6000.

Gogol (gō'gol), NIKOLAI VASSILJEVICH, a Russian author, born in the province of Poltava in 1809; died 1852. He went to St. Petersburg in 1829 and tried the stage, but failing, found his true vocation in literature. His works are extremely popular in Russia for their graphic and humorous delineation of everyday life and manners, and more especially Russian country life. Among his most notable works are—*Evenings at the Farm* (1832); *Mirgorod*, a collection of tales (1834); the *Dead Souls* (1842), a satirical novel, depicting the public abuses and barbarism of manners prevalent in the provinces; and *Revisor*, a comedy. His later years were tinged with religious mysticism, and he wrote some curious *Confessions*.

Jogra (gog'ra), the chief river of Oudh, forming an important waterway for that quarter of India. It is a tributary of the Ganges; length, 600 miles.

Goiter (goi'tẽr), or BRONCHOCELE (bron'ko-sēl), known also in Great Britain as 'Derbyshire neck,' a disease endemic in Derbyshire, Switzerland, some parts of France and South America, and in many other parts of the world, chiefly in valleys and elevated plains in mountainous districts. It is a morbid enlargement of the thyroid gland, forming a soft and more or less mobile tumor or swelling, without any sign of inflammation, on the anterior part of the neck. It sometimes grows to such a size as to hang down over the breast, and respiration and swallowing may be impeded by it, though often it causes little inconvenience. It is regarded as the result of a combination of causes, among which is the drinking of water impregnated with lime or chalk, these substances being ingested with the water. It is treated by giving small doses of the thyroid glands of sheep or by surgical excision.

A Female Affected with Goiter.

Gokcha (gok-cha'), GOKTSCHA, a lake in Russian Armenia, occupying a triangular cavity 540 square miles in extent, at an elevation of 6400 ft. above the sea. It receives the water of several streams without having any considerable outlet.

Golconda (gol-kon'da), a fortress and ruined city of India in the Nizam's dominions, 7 miles W. of Hyderabad. The fort is now used as the Nizam's treasury, and also as a state prison. In former times Golconda was a large and powerful kingdom of the Deccan, but was subdued by Aurengzebe in 1687, and annexed to the dominions of the Delhi empire.

Gold (gōld), a precious metal of a bright yellow color, and the most ductile and malleable of all the metals; symbol Au (Lat. *aurum*); atomic weight, 196. It is one of the heaviest of the metals, and not being liable to be injured by exposure to the air, it is well fitted to be used as coin. Its ductility and malleability are very remarkable. It may be beaten into leaves so exceedingly thin that 1 grain in weight will cover 56 square inches, such leaves having the thickness of only $\frac{1}{282000}$th part of an inch. It is also extremely ductile; a single grain may be drawn into a wire 500 feet long, and an ounce of gold covering a silver wire is capable of being extended upwards of 1300 miles. It may also be melted and remelted with scarcely any diminution of its quantity. It is soluble in nitromuriatic acid or *aqua regia*, and in a solution of chlorine. Its specific gravity is 19.3, so that it is about nineteen times heavier than water. The fineness of gold is estimated by carats, pure gold being 24 carats fine. (See *Carat*.) Jeweler's gold is usually a mixture of gold and copper in the proportions of three-fourths of pure gold with one-fourth of copper. Gold is seldom used for any purpose in a state of perfect purity on account of its softness, but is combined with some other metal to render it harder. Standard gold, or the alloy used for the gold coinage of Britain, consists of twenty-two parts of gold and two of copper (being thus 22 carats fine). Articles of jewelry in gold are made of every

degree of fineness up to 18 carats, i. e., 18 parts of gold to 6 of alloy. The alloy of gold and silver is found already formed in nature, and is that most generally known. It is distinguishable from that of copper by possessing a paler yellow than pure gold, while the copper alloy has a color bordering upon reddish yellow. Palladium, rhodium and tellurium are also met with as alloys of gold.

Gold has been found in smaller or larger quantities in nearly all parts of the world. It is commonly found in reefs or veins among quartz, and in alluvial deposits; it is separated, in the former case, by quarrying, crushing, washing, and treatment with mercury. The rock is crushed by machinery, and then treated with mercury, which dissolves the gold, forming a liquid amalgam; after which the mercury is volatilized, and the gold left behind; or the crushed ore is fused with metallic lead, which dissolves out the gold, the lead being afterwards separated by the process of cupellation. By the 'cyanide process,' in which cyanide of potassium is used as a solvent for the gold, low-grade ores can be profitably worked. In alluvial deposits it is extracted by washing, in dust grains, laminæ, or nuggets. In modern times large supplies of gold were obtained after the discovery of America from Peru, Bolivia, and other parts of the New World. Till the discovery of gold in California, a chief source of the supply was the Ural Mountains in Russia. An immense increase in the total production of gold throughout the world was caused by the discovery of gold in California in 1848, and that of the equally rich gold-fields of Australia in 1851. The yield from both sources has considerably decreased. Other sections of the United States have of late years proved prolific sources of gold, especially Colorado, which now surpasses California in yield and Alaska, which equals it. Canada has gold-fields in several localities, the richest being those of the Klondike. At present the richest gold-field in the world is that of South Africa, which yielded in 1910 a value of $175,000,000, somewhat exceeding the combined yield of the United States and Australia. Russia and Mexico followed these in yield. The total production throughout the world amounted to over $450,000,000, of which the United States produced $96,000,000. Enormous quantities of gold are consumed in the arts and are lost by wear of coin and jewelry.

Goldau (gōld'ou), a valley in Switzerland, in the canton of Schwyz, between the Rigi and the Rossberg. It was the scene of a tremendous landslip (2d Sept., 1806) by which a portion of the Rossberg, about 3 miles long, 1000 feet broad, and 100 feet thick, fell in one mass into the valley, burying several villages and killing upwards of 450 persons.

Goldbeater's Skin, a thin membrane prepared from the large intestine of the ox used by gold-beaters and was formerly sometimes used in surgery.

Goldbeating, the art or process of producing the extremely thin leaves of gold used in gilding, etc. The gold is cast into ingots weighing about 2 oz. each, and measuring about ¾ of an inch broad. These ingots are passed between steel rollers till they form long ribbons of such thinness that a square inch will weigh 6½ grains. Each one of these is now cut into 150 pieces, each of which is beaten on an anvil till it is about an inch square. These 150 plates are interlaid with pieces of fine vellum about 4 inches square, and beaten till the gold is extended nearly to the size of the vellum leaves. Each leaf is then divided into four, interlaid with goldbeater's skin, and beaten out to the dimensions of the skin. Another similar division and beating finishes the operation, after which the leaves are placed in paper books ready for use.

Goldberg (gōlt'berg), a town in Prussia, province of Silesia, 14 miles southwest of Liegnitz. The place owes its origin and name to a gold mine in the neighborhood, abandoned since the fifteenth century. Pop. 6804.

Gold Coast, a British crown-colony in W. Africa, comprising that part of the Guinea coast which extends from 3° 30′ W. to 1° 30′ E. lon., stretching inland to an average distance of 50 miles. Estimated area, 15,000 sq. miles. To this has been recently added a protectorate, chiefly from Ashantiland, of about 31,600 sq. miles, and a further region known as the Northern Territories of the Gold Coast, between 8° and 11° N. latitude. The climate is unhealthy. The first settlements on the Gold Coast were made by the Portuguese, who built the fort of Elmina, which was seized by the Dutch in 1637. Subsequently there were a number of Dutch and English settlements established, but the former were transferred to Britain in 1872. The chief forts and settlements are Cape Coast Castle, Elmina, Accra, Axim, Dixcove, and Annamaboe. The chief products are gold, palm-oil, ivory, copal, caoutchouc, etc. Estimated population, 2,700,000, of whom about 150 are Europeans.

Golden Age, that early mythological period in the history of almost all races, fabled to have been one of primeval innocence and enjoyment, in which the earth was common property, and brought forth spontaneously all things necessary for happy existence, while beasts of prey lived at peace with other animals. The Romans referred this time to the reign of Saturn. The so-called 'golden age' of Roman literature is reckoned from the time of Livius Andronicus, 250 B.C., to the death of Augustus Cæsar, A.D. 14.

Golden Beetle, the popular name of several tetramerous beetles of the genus *Chrysomĕla*. Their most obvious characteristic is the great brilliancy of their color. There are none of large size. Among species found in the United States is the Ladder Beetle.

Golden Bull, an important document in the history of Germany issued by the Emperor Charles IV in 1356. Its immediate object was to regulate for all time coming the mode of procedure in the election and coronation of the emperors.

Golden Calf, an image cast by Aaron from the earrings of the people for the worship of the Israelites while encamped at the foot of Mount Sinai. Two similar idols were set up by King Jeroboam, centuries later, one in Dan, the other in Bethel.

Golden-Crested Wren, GOLDEN-CRESTED REGULUS, or KINGLET (*Regŭlus cristātus*), a beautiful bird belonging to the family Sylviadæ, distinguished by an orange crest. It is the smallest of British birds, being only about 3½ inches in length, is very agile, and almost continually in motion.

Golden Eagle. See *Eagle.*

Golden-eye, *Clangŭla vulgāris*, a species of wild duck. See *Garrot.*

Golden Fleece, in classical mythology, the fleece of gold in quest of which Jason undertook the Argonautic expedition to Colchis. The fleece was suspended in an oak tree in the grove of Ares (Mars), and was guarded by a dragon. When the Argonauts came to Colchis for the fleece, Medea put the dragon to sleep and Jason carried the fleece away. See *Argonauts, Jason, Medea.*

Golden Fleece, ORDER OF THE, *Toison d'or*, a military order instituted by Philip the Good, Duke of Burgundy, in 1429, on the occasion of his marriage with the Portuguese princess, Isabella. The order now belongs to both Austria and Spain. The knights carry suspended from their collars the figure of a sheep or fleece in gold.

Golden Gate, the entrance from the Pacific Ocean to the harbor of San Francisco, a waterway about 5 miles long and 1 mile wide and with a strikingly beautiful and picturesque setting.

Golden Horde, originally the name of a powerful Mongol tribe, but afterwards extended to all the followers of Genghis Khan, and of Batu, the grandson of Genghis Khan, who invaded Europe in the thirteenth century. Under Batu the Golden Horde advanced westwards as far as the plain of Mosi in Hungary, and Liegnitz in Silesia, at both of which bloody battles were fought in 1241. They founded the empire of the Kiptshaks, or the Golden Horde, which extended from the banks of the Dniester to the Ural, and from the Black Sea and the Caspian to the mouth of the Kama and the sources of the Khoper. This empire lasted till towards the close of the fifteenth century, when it was overthrown by Ivan III.

Golden Horn, the harbor of Constantinople, an inlet of the Bosporus, so called from its shape and beauty.

Golden Legend (*Aurea Legenda*), a collection of legends of the Saints made in the 13th century by Jacobus de Voragine, archbishop of Genoa (died 1298). It consists of 177 sections, each of which is devoted to a particular saint or festival, arranged in the order of the calendar. Caxton printed a translation in 1483, and another edition was produced by Wynkyn de Worde in 1498.

Golden Number, in chronology a number showing the year of the moon's cycle; so called from having formerly been written in the calendar in gold. To find the golden number add 1 to the given year, and divide the sum by 19, what remains will be the number required, unless 0 remains, for then 19 is the golden number.

Golden Pheasant. See *Pheasant.*

Golden-rod (*Solidāgo*) is a genus of plants, natural order Compositæ, chiefly natives of North America, and abundant in many parts of the United States. Most of the species have erect, rod-like, scarcely-branched stems, with alternate serrated leaves and terminal spikes or racemes of small, yellow flowers. They flower in the late summer and early autumn.

Golden Rose, in the Roman Catholic Church an ornament of gold consecrated by the pope on the fourth Sunday of Lent. It was originally a single flower of wrought gold, colored red; afterwards the golden petals were decked with rubies and other gems; finally the form adopted was that of a thorny branch, with several flowers and leaves, and one principal flower at the top, all of pure gold. It is sent to some favored prince, some eminent church, or distinguished personage.

Golden Rule, the rule laid down by Jesus in the Sermon on the Mount: 'Therefore all things whatsoever ye would that men should do to you, do you even so to them.'

Golden Saxifrage, the popular name for plants of the genus *Chrysosplenium*, a small genus of Saxifragaceæ, consisting of annual or perennial rather succulent herbs, with alternate or opposite crenate leaves, and inconspicuous greenish axillary and terminal flowers. They are natives of Central and Northern Europe, the Himalayas, and parts of America.

Goldfinch, a common European bird, the *Fringilla carduēlis*, belonging to the Finch family. It is about five inches in entire length, black, scarlet, yellow, and white being beautifully mingled in its plumage. The colors of the female are duller than those of the male. Its brilliant plumage, soft and pleasant song, and docility make it a favorite cage-bird. The black-headed goldfinch, native of South America, and accidental in the United States, has a black head.

Golden Wedding, the 50th anniversary of a wedding, in which it is understood that the presents given to the married couple shall all be of gold.

Goldfish, the trivial name of a beautiful species of carp, found in the fresh waters of China. It is greenish in color in the natural state, the golden yellow color being found only in domesticated specimens, and retained by artificial selection. These fishes are reared by the Chinese in small ponds, in basins, or porcelain vessels, and kept for ornament. By careful selection, many strange varieties and monstrosities have been propagated. They are now distributed over nearly all the civilized parts of the world, but in large ponds they readily revert to the color of the original stock.

Gold Lace, a fabric woven of silken threads which are either themselves gilt or are covered with fine gilt silver wire. In the former the gold-leaf is fixed directly on the threads by means of a gum. In the latter finer kind the fine gilt silver wire is twisted compactly round the silk threads, which are then ready for being manufactured into lace.

Gold Leaf, one of the forms in which gold is applied for the purpose of gilding. It is prepared by a prolonged beating out of the metal between sheets of vellum and thick skin. A preliminary fusion at a high temperature serves to increase the malleability of the gold. After beating the leaves are placed in books holding twenty-five. The leaves are about three and a quarter inches square and are produced in ten different shades of color, according as the gold was alloyed with much or little cooper or silver.

Goldmark (gōld'märk), KARL, an Austrian musical composer, born at Keszthely, Hungary, in 1830; died in 1915. *The Queen of Sheba*, produced at the Court Opera in 1875, brought him wide recognition, but he is best known by his symphony, *The Rustic Wedding*, and his overture, *Sakuntala*. Other works include a short opera, *The Cricket on the Hearth*, and *Merlin*

Gold of Pleasure, the *Camelina sativa*, a cruciferous annual, with arrow-shaped leaves and terminal racemes of yellow flowers. It is cultivated to a considerable extent in Europe for its seeds, which are fed to cattle, and also yield a useful oil.

Goldoni (gol-dō'nē). CARLO, a celebrated Italian writer of comedies, born at Venice in 1707; died at Paris 1793. He settled as a advocate in Venice, but shortly took to a wandering life with strolling players, until in 1736 he married the daughter of a notary and settled down in Venice. Here he first began to cultivate that department of dramatic poetry in which he was to excel; namely, description of character and manners. After this he took Molière for his model. In 1761 the Italian players invited him to Paris, where many of his pieces met with uncommon applause. He became reader and master of the Italian language to the daughters of Louis XV; and for a time received a pension. His best known works include *La Bottega di Caffè*, *La Baruffe Chiozzotte*, *I Rusteghi*, *Todero Brontolon*, *Gli Innamorati*, *Il Ventaglio*, *Belisario*, *Momolo Courtesan*, *La Notte Critica*, *La Bancarotta*, *La Donna Di Garbo*, *L'Impostore*, *Locandiera*, *La Pamela* and *Dama Prudente*. His autobiography appeared in 1787.

Goldsboro (gōldz'bo-ro), a city of North Carolina, capital of Wayne County, 49 miles S. E. of Raleigh. It is of importance as a railroad center, and has manufactures of carriages, machinery, mattresses, furniture, cotton, boxes, etc.; also oil and rice mills, woodworking establishments, etc. Pop. 6107.

Goldschmidt (golt'shmit), MEIER AARON, a Danish novelist, born of Jewish parents in 1819; died 1887. In 1840 he founded what became the most famous of Danish newspapers, *The Corsair*, celebrated for its brilliant wit and audacious satire. In 1845 he published his first novel, *A Jew*, which was translated into English and several other European languages. In 1847 he published a collection of short stories, and began the issue of another newspaper, *North and South*. His chief novels are *Homeless*, *The Heir*, *The Raven*, and *The Vacillator*. He also published a series of short stories of Jewish life, and a play, *The Rabbi and the Knight*. His style is said to be the most graceful in the language.

Goldsmith (gold'smith), OLIVER, poet and miscellaneous writer, born in 1728, at Pallas, County Longford, Ireland; died in London in 1774. His father, a clergyman of the Established Church, held the living of Kilkenny West. In 1745 he was entered as a sizar at Trinity College, Dublin. In 1749, shortly after his father's death, he quitted Dublin with the degree of bachelor, and was advised by an uncle who had already borne a large part of the expenses of his education, to prepare for holy orders. Rejected for holy orders, he became tutor in a family, but soon lost his situation on account of a dispute with the master of the house over a game at cards. The same uncle who had given him assistance before now gave him £50 to go to Dublin to study law, but he had scarcely arrived at the city when he lost the whole sum in gambling. In spite of his repeated imprudences he was once more succored by his uncle, who supplied him with means to go to Edinburgh to study medicine. Here he remained eighteen months, during which he acquired some slight knowledge of chemistry and natural history. At the end of this period he removed to Leyden, again at the expense of his uncle; and afterwards wandered over a large part of France, Germany, Switzerland, and Italy. It was probably at Padua that he took a medical degree, as he remained there six months; but his uncle dying while he was in Italy he was obliged to travel on foot to England, and reached London in 1756 with a few pence in his pocket. After some years of hard experience as a chemist's assistant, medical practitioner, proofreader, and school usher, he drifted into literature. He conducted a department in the *Monthly Review*, wrote essays in the *Public Ledger* (afterwards published under the title of the *Citizen of the World*), and a weekly pamphlet, entitled the *Bee*. In 1761 he was introduced to Dr. Johnson. In 1764 he appeared as a poet by the publication of his *Traveler*. In 1766 appeared his *Vicar of Wakefield*, which at once secured merited applause. In 1768 his comedy of the *Good-Natured Man* was acted at Covent Garden with but indifferent success. His poetical fame was greatly enhanced by the publication of his *Deserted Village*, in 1770. In 1773 he produced his comedy of *She Stoops to Conquer*, which was completely successful. He also compiled histories of England, Greece, and Rome; and a *History of the Earth and Animated Nature*, a pleasing work, but one of no scientific value. His last days were embittered by the pressure of debt, incurred partly by his improvidence and partly by his generosity. The manners of Goldsmith were eccentric, even to absurdity. As a poet, his *Traveler* and *Deserted Village* have given him a deserved reputation; and his *Vicar of Wakefield* is one of the best known and most delightful of English novels.

Oliver Goldsmith

Gold Wire, an ingot of silver superficially covered with gold, and drawn through a great number of holes of different sizes until it is brought to the requisite fineness.

Golf, a game played with clubs and balls, over a tract of ground called links, a full course comprising 18 holes, ranged at distance varying from 166 to 600 yards from each other, and usually totalling a distance of about 6000 yards. [Courses comprising fewer holes are also laid out where the tract of ground is too small for the full number of holes.] The clubs are of different uses, and have different names according to the purpose for which they are respectively designed; as the *driver*, *brassie*, *putter*, *mashie*, *mid-iron*, *cleek*, *niblick* and *jigger*. The rival players are one on each side, which is called a two-some, or t[illegible] against two, called a four-some. The object of the game is, starting from the first 'tee,' where the ball is put in place, to drive the ball into the first hole with as few strokes as possible, and so on with all the holes in succession, the side which holes its ball on any occasion with the fewest strokes being said to gain the hole. The match is usually decided by the greatest number of holes gained in one or more rounds, called match play, or the aggregate number of strokes taken to 'hole' one or more rounds, called medal play.

Mid-Iron.

Golgotha (gol'gō-tha). See *Calvary*.

Goliath (go-lī'ath), giant of Gath slain by David (I Sam., xvii). His height was 'six cubits and a span,' which, taking the cubit at 21 inches, would make him a little over 11 feet. The Septuagint and Josephus read, '*four* cubits and a span.'

Goliath Beetle, the popular name of the beetles of the genus *Goliăthus*, natives of Africa and South America, remarkable for their large size, and on account of their beauty and rarity much prized by collectors. There are several species, as *G. cacicus* (goliath beetle, proper), *G. polyphēmus*, *G. micans*, etc. *G. cacicus*, a South American species, is roasted and eaten by the natives of the district it inhabits, who regard it as a great dainty. It attains a length of 4 inches.

Gollnow (gol'no), a town in Prussia, 14 miles northeast of Stettin. Pop. 8539.

Goloshes (gu-lo[illegible]es), a word introduced into our language from the French *galoche*, but originally derived from the Spanish *galocha*, meaning a wooden shoe or clog. It was formerly applied by the English to a kind of wooden clogs. The name is now restricted to overshoes, now generally made of vulcanized India rubber.

Gomarites (gō'mar-itz), Gomarists, followers of *Francis Gomar*, a Dutch disciple of Calvin in the seventeenth century. The sect, otherwise called Dutch Remonstrants, very strongly opposed the doctrines of Arminius, adhering rigidly to those of Calvin. See *Reformed Church*.

Gombroon (gom'brön), another name for *Bender Abbas*, which see.

Gomera (gō-mā'ra), one of the Canary Islands, about 12 miles by 9 in extent; pop. 15,358. It has two towns, St. Sebastian and Villa Hermosa.

Gomez (gom'ez), Maximo, a Cuban patriot, born in Barri, San Domingo, in 1838; died in Cuba in 1905. He served as a lieutenant in the Spanish army sent to occupy San Domingo and won distinction in the battle of San Lome. After San Domingo won its freedom he went with the Spanish troops to Cuba, where, becoming incensed at the actions of the government toward the peasants, he left the army and joined the patriots, becoming an able and successful leader in the war of 1868-78. He was promoted major-general and afterwards made commander-in-chief of the patriot army. In the revolt of 1895 he again joined the Cuban insurgents, and fought with distinction till the Americans occupied Cuba. In 1899 he was given a reception and banquet in Havana by the United States military authorities.

Gomez (go'mes), Sebastiano, a Spanish painter, born at Seville about 1616; died about 1690. He was originally a slave of Murillo, but on account of his genius he was liberated by his master and received and taught among his pupils.

Gomorrah (go-mor'a). See *Sodom*.

Gompers (gom'pers), Samuel, labor leader, born in London in 1850, came to the United States in 1863. Here he became a cigarmaker, early took part in the organization of workingmen, and was one of the founders of the American Federation of Labor, and editor of the *American Federationist*. In 1882 he became president of the Federation, which position he still retains. As such he is a power in the labor world, the

Federation including over a hundred national and international labor unions. On the entrance of the United States into the European War in 1917 he was selected as one of the six members of the Advisory Commission of the Council of National Defense. He gave himself enthusiastically and successfully to the healing of the differences between capital and labor so as to insure a successful prosecution of the war. It was due largely to him that industrial peace was maintained while the country was at war. He declined to meet the Germans who invited him to attend a conference of the German Federation of Trade Unions to discuss peace. Instead, he visited Great Britain and other Allied countries, meeting the representatives of labor and inspiring them with his own ardor and discouraging any attempts to dicker with the enemy.

Gomul Pass (go-mul'), a pass across the Sulaimán range, from the Punjab into Afghanistan. It follows the course of the Gomul River, and is an important trading highway.

Goncourt (gon-kör), the name of two French novelists, brothers, EDMOND DE (1822-96) and JULES DE (1830-70), the first born at Nancy, the second at Paris. Their first literary efforts were in the field of history, but they are best remembered for their work in the French realistic school of fiction. Chief among their novels are *Charles Demailly* (1860), *Sœur Philomène* (1861), *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), *Manette Salomon* (1867) and *Madame Gervaisais* (1869). The following studies by Edmond alone are also important: *L'Art au XVIII e Siècle* (1874), *L'Oeuvre de Watteau* (1876), *L'Oeuvre de Prudhon* (1877).

Gonaives (gō-na-ēv'), a town on the west coast of Hayti, on the bay of the same name, 65 miles N. N. W. of Port au Prince. It has an excellent harbor. The exports are cotton, coffee, salt and mahogany. Pop. about 18,000.

Gonda (gon'da), chief town of district of the same name, Oudh, India, 28 miles N. N. W. of Fryzábád. Pop. about 15,000. The district has an area of 2881 sq. miles.

Gondar (gon'dăr), a chief town of Abyssinia, formerly the residence of the king, and still the ecclesiastical headquarters, is situated on a hill of considerable height, about 22 miles north of Lake Dembea. The town is divided into several quarters; contains many churches, and the ruins of a magnificent towered castle, built in the sixteenth century by Indian architects under the direction of Portuguese settlers. It was burned by King Theodore in 1868. Pop. 6000.

Gondokoro (gondo-kō'ro), formerly a trading and missionary station and military port on the Bahr el Abiad or White Nile, lat. 4° 55' N.; for a time the chief seat of the Egyptian government of the Upper Nile, and important as a center of the ivory and slave trade, but now deserted during most of the year, though it still has an ivory trade.

Gondola (gon'du-la), a sort of barge, curiously ornamented, and navigated on the canals of Venice. The middle-sized gondolas are upwards of 30 feet long and 4 broad; they always terminate at each end in a very sharp point, which is raised perpendicularly to the height of a man. Near the center is a curtained chamber for passengers. The boatman is called *gondolier*.

Gonds, the aboriginal or rather non-Aryan inhabitants of the old territorial division of Hindustan called Gondwana, corresponding pretty nearly to what is now called the Central Provinces. After a long period of repression, they attained to a position of great prominence and power, and in the sixteenth, seventeenth, and eighteenth centuries three Gond dynasties simultaneously held almost the whole Gondwana under their sway. With a rise of the Mahrattas the power of the Gonds declined, and in 1781 the last of their dynasties was overthrown and the independence of the Gonds ceased. Their numbers have been variously estimated up to 2,000,000, partly under feudatory states and partly under the British government, in the Central Provinces.

Gondwana (gund-wă'na), an extensive, imperfectly defined tract of Central India. See *Gonds*.

Gonfalon (gon'fa-lon), an ensign or standard; especially an ensign having two or three streamers or tails, fixed on a frame made to turn like a ship's vane, or, as in the case of the papal gonfalon, suspended from a pole similarly to a sail from a mast. The person entrusted with the gonfalon in many of the mediæval republican cities of Italy was often the chief personage in the state.

Gong, a Chinese musical instrument made of an alloy of copper (about seventy-eight parts) and tin (about twenty-two parts), in form like a round flat dish with a rim two to three inches in depth. It is struck

by a kind of drumstick, the head of which is covered with leather, and is used for the purposes of making loud, sonorous signals, of marking time, and of adding to the clangor of martial instruments.

Gongora y Argote (gon-go'rȧ ar-go'tē), Luis, a celebrated Spanish poet, was born at Cordova in 1561; died there in 1627. He was educated for the church, and was made chaplain to the king, and a prebendary in the cathedral of Cordova. His works consist chiefly of lyrical poems, in which he excelled. He introduced a new poetic phraseology called the *estilo culto*, and founded a school of writers, the *Gongoristas*, who carried this depraved style to an absurd length.

Gonidia (gō-nid'i-a), the name given to the secondary, reproductive, green, spherical cells in the thallus of lichens, forming the distinctive mark between those plants and fungi.

Goniometer (gō-ni-om'e-tėr), an instrument for measuring solid angles, particularly the angles formed by the faces of crystals. The *reflecting goniometer* is an instrument of this kind for measuring the angles of crystals by determining through what angular space the crystal must be turned so that two rays reflected from two surfaces successively shall have the same direction.

Gonorrhœa (gon-o-rē'a), a specific contagious inflammation of the male urethra or the female vagina, attended, from its early stages, with a profuse secretion of much mucus intermingled with pus. This secretion contains the germ of the disease. Though termed a venereal disease, it is totally distinct from syphilis. It is a painful disease, and may result in the chronic catarrh called gleet, or may lead to stricture and other serious evils in the male and inflammation of uterus, Fallopian tubes, ovaries, or peritoneum in the female, necessitating various excision operations and perhaps resulting in permanent invalidization of the person affected. Various other complications may occur in both sexes, and carelessness on the part of the sick may result in gonorrhœal inflammation of the eyes, which is very likely to cause blindness. Sterility may result in both sexes.

Gonsalvo (gon-sȧl'vo), Hernandez y Aguilar, de Cordova, a Spanish soldier, called the *great captain* (*el gran capitan*), was born at Montilla, near Cordova, in 1453; died at Granada, 1515. He distinguished himself in the Portuguese war which began in 1475, and in the great war with the Moors, which ended with the conquest of Granada in 1492. In 1495 he was sent to assist Ferdinand II, King of Naples, against the French, who occupied the whole of that kingdom. In less than a year Gonsalvo drove the French over the Neapolitan frontiers, and returned to Spain, where he was engaged in subjecting the Moors in the Alpujarras, when Louis XII of France renewed the war against Naples. Gonsalvo again took the field, and by the victory near Seminara in 1502 obtained possession of both Calabrias. In 1503 he gained a still more important victory near Cerignola, in consequence of which Abruzzo and Apulia submitted, and Gonsalvo marched into Naples. He then sat down before Gaëta. As the siege was protracted, he gave up the command to Don Pedro Navarro, and advanced to meet the enemy. He defeated the Marquis of Mantua; and on the Garigliano, with 8000 men, obtained a complete victory over 30,000 French, the consequence of which was the fall of Gaëta. The possession of Naples was now secured. He was viceroy in Italy until 1507, when, through the jealousy of the king and the calumnies of the courtiers, he was deprived of his office. He thereupon retired to Granada, at which place he died.

Gonzaga Family (gon-zȧ'gȧ), a famous Italian family who ruled over Mantua for over three centuries. Many illustrious soldiers, statesmen, churchmen, and promoters and cultivators of arts, science, and literature sprang from this stock. They became extinct in 1708.

Good, James Isaac, an American theologian, born at York, Pennsylvania, in 1850. Studied at Union Theological Seminary; was ordained to the German Reformed ministry, 1875, and held several pastorates. He was successively professor of church history (1890–93) and dean of the theological seminary (1893–1907) at Ursinus College, Philadelphia; and professor of Reformed Church history in the Central Theological Seminary, Dayton, Ohio. He has published several works, including a *History of the Reformed Church in Germany and in the United States.*

Goodale (good'ȧl), George Lincoln, botanist, born at Saco, Maine, in 1839. He became a lecturer in medical schools in Maine, in 1870 professor of natural sciences in Bowdoin College; in 1882 instructor in botany in Harvard; later professor; and in 1888 Fisher professor of natural history; cu-

rator of botanical museum, 1879-1909; since honorary curator.

Goodall (good'al), Edward, line-engraver, born at Leeds, England, in 1795. He was self-taught, and early in his career attracted the notice of Turner, a number of whose pictures he engraved, including the large plates of Tivoli and Cologne, and various plates in the England and Wales and Southern Coast series. He also engraved many plates for the annuals, and the largest number of the landscapes after Turner that illustrate the elegant editions of Rogers's *Italy* and *Poems*. He engraved a number of plates for the *Art Journal*, several from pictures by his son, Frederick Goodall, of which the *Cranmer at the Traitors' Gate* and the *Happy Days of Charles I*, both of large size, are the most important. He died in London in 1870.

Goodall, Frederick, an English painter, son of Edward Goodall, the engraver; born in London in 1822; died in 1904. At seventeen years of age he began to exhibit, and produced pictures very varied in subject and generally of high excellence. He was elected A. R. A. in 1853, and R. A. in 1863. Exemplifying variety, the following may be named; *Raising the Maypole in the Olden Time* (1851), *Cranmer at the Traitors' Gate* (1856), *The Opium Bazaar, Cairo* (1863), *Mater Purissima and Mater Dolorosa* (1868), *The Subsiding of the Nile* (1873), *The Holy Mother and Child* (1876), *The Flight into Egypt*, and *A New Light of the Harem* (1884).

Goode, George Brown, ichthyologist, born at New Albany, Indiana, in 1851; died in 1896. He studied in the Harvard Museum of Comparative Anatomy, and from 1874 till his death was connected with the Fish Commission and the National Museum. Became assistant secretary of the Smithsonian Institution in 1887. He wrote *The Fishes of Bermuda, A History of the Menhaden, Game Fishes*, and *Food Fishes* of the United States, etc.

Good Friday, a fast of the Christian Church in memory of our Saviour's crucifixion, kept on the Friday of Passion Week, that is, the Friday before Easter. It has been celebrated from a very early perio' In the Roman Catholic Church the celebration of this fast includes prayers for all classes of people, including heretics, schismatics, pagans, and Jews, and the 'Adoration of the Cross,' but no mass is celebrated. In nearly all Protestant churches the day is observed, and special religious services are held. The practice of eating hot 'cross-buns' on this day has now no religious significance.

Good Hope, Cape of. See *Cape of Good Hope*.

Goodnow (good'nō), Frank Johnson, an American educator, born in Brooklyn, New York, January 18, 1859. He was graduated from Amherst in 1879 and from the Columbia Law School in 1882. He was instructor or professor in administrative law and municipal science at Columbia, 1883–1914; collaborated with James Bryce in the preparation of *The American Commonwealth* and was chosen by China as her constitutional adviser. In 1914 he was elected president of Johns Hopkins University.

Goodrich (good'rich), Samuel Griswold, author, born at Ridgefield, Connecticut, in 1793; died in 1860. He was a publisher in Hartford and afterwards in Boston. He is best known as 'Peter Parley,' a pseudonym assumed in writing, editing, and compiling children's books. During President Fillmore's administration he acted as American consul at Paris. He wrote *Recollections of a Lifetime: Sketches from a Student's Window*, etc.

Goods and Chattels, the legal and popular denomination for personal property as distinguished from things real, or lands, tenements, or hereditaments.

Good Templars, Independent Order of, a temperance brotherhood which combines the principles of teetotalism with certain mystic rites, imitated less or more from freemasonry, having secret signs, passwords, and insignia peculiar to itself. It originated in New York in 1851, and extended to Britain in 1868.

Good-will, the benefit derived from a business beyond the mere value of the capital, stock, funds, or property employed in it, in consequence of the general public patronage and encouragement which it receives from constant and habitual customers. It has legally considered a subject of sale along with the stock, premises, fixtures, trade debts, etc.

Goodwin Sands, certain dangerous sandbanks, about 4 or 5 miles off the east coast of Kent.

Goodyear (good'yēr), Charles, inventor, was born in New Haven, Connecticut, in 1800. For many years he experimented with India rubber, to form from it a solid elastic material, and in 1844 obtained his first patent. He endured great privations in his efforts, even after he had succeeded in hardening rubber by the addition of sulphur, and,

although winning the grand prize in the London and Paris World's fairs of 1851 and 1855 and the cross of the Legion of Honor, he died in poor circumstances in 1880.

Goole (gōl), a town and river-port of England, county of York (West Riding), on the Ouse, 23 miles west by south of Hull. The town dates from 1829, when it became a bonding port, and it has a good shipping trade. Besides the tidal basin a series of large and commodious docks have been constructed. The exports are chiefly coal, machinery, and woolen goods. Ship and boat building, sailmaking, iron-founding, artificial manure and agricultural machine making are carried on to some extent. Pop. (1911) 20,334.

Goorkhas (gōr'kaz), the mountaineers of Nepaul, Northern India, with whom a good understanding with the British exists. They now freely enter the native army, and are amongst the most faithful and courageous of the Indian troops, having particularly distinguished themselves in the battles of the Satlej in 1845-46, during the mutiny of 1857, in the war with Afghanistan in 1878-79, and in the short Egyptian campaign of 1882. They are Hindus in religion.

Goosander (gō-san'der; *Mergus*), a genus of migratory natatorial birds, characterized by a beak thinner and more cylindrical than that of the ducks, and having each mandible armed at its margins with small, pointed teeth, directed backward like a saw, the upper mandible being curved down at its extremity; there are about seven species. *M. Merganser*, the goosander or merganser proper weighs about 4 lbs. It is an Arctic bird, moving south in winter, and in severe seasons frequents the lakes and rivers of Britain. It feeds principally on fish, which it seizes by rapid diving. The *M. serrātor*, the red-breasted goosander, measures about 21 inches in length, and weighs about 2 lbs. The *M. cucullātus* is the hooded goosander peculiar to North America.

Goose (gōs), the common name of the birds belonging to the family Anserida or Anseres of earlier authors, a well-known family of natatorial birds. The domestic goose lives chiefly on land and feeds on grass; there are many varieties, but they do not differ widely from each other. It is valued for the table, and on account of its quills and fine soft feathers. The common wild goose, or grey-lag, which is migratory, is the *Anser ferus*, and is believed to be the original of the domestic goose. The Snow-goose (*A. hyperboreus*) of North America is 2 feet 8 inches in length, and its wings are 5 feet in extent. The bill of this bird is very curious, the edges having each twenty-three indentations or strong teeth on each side. The inside or concavity of the upper mandible has also seven rows of strong, projecting teeth, and the tongue, which is horny at the extremity, is armed on each side with thirteen long and sharp bony teeth. The flesh of this species is excellent. The *Laughing* or *White-fronted Goose* (*A. albifrons*) inhabits the northern parts of both continents, and migrates to the more temperate climates during the winter. The *bean-goose* (*A. segĕtum*) is also common to both continents. The *Canada goose* (*A.* or *Cygnopsis Canadensis*) is the common wild goose of the United States, and is known in every part of North America. It is also found in Europe. Other species are the *bernicle goose* and the *brent goose* (which see), the *dusky goose* (*A. rufescens*) and the *pink-footed goose* (*A. brachyrhynchus*).

Gooseberry (gōs'ber-i; *Ribes grossularia*), a low, branching shrub, growing wild in Siberia and the north of Europe, other species being found in North America. Along with the currants it forms the order Grossulariaceæ, which is now usually combined with Saxifragaceæ. The branches are armed with numerous prickles, and bear three to five lobed leaves and inconspicuous flowers. The fruit is a succulent berry, very wholesome and agreeable, of various colors—whitish, yellow, green, and red. Gooseberries are popular fruits for preserving, and are extensively cultivated, being of very easy culture. They may be raised from slips, which is the usual mode of perpetuating varieties; new varieties are raised from seed. The plant of four years old produces the largest and finest fruit; afterwards the fruit becomes smaller, but increases in quantity. *R. niveum*, an American species, has fine white flowers, and is cultivated as an ornamental shrub.

Goosefish, the Angler (which see).

Goosefoot (*Chenopodium*) is a genus of plants, nat. order Chenopodiaceæ, indigenous to the temperate parts of the eastern continent. They are weedy plants common in waste places, and bear small, greenish flowers, which are sessile in small clusters, collected in spiked panicles. *C. botrys*, the Oak of Jerusalem, is found in sandy fields from New England to Illinois. The seeds of *C. quinoa* of Peru are used as food. See *Quinoa*.

Goosegrass. See *Cleavers.*

Gopher (gō'fer), the name of various burrowing animals, natives of North America. The *Geomys bursarius*, or pouched rat, has large cheek-pouches extending from the mouth to the shoulders, incisors protruding beyond the lips, and broad, mole-like forefeet. Several American burrowing squirrels also get this name, as *Spermophilus Franklinii*, *S. Richardsonii*, etc.; as also a species of burrowing land-tortoise of the Southern States, whose eggs are valued for the table.

Gopher-wood, the wood of which Noah's ark was built. The name does not convey to us any idea of what species of wood is meant.

Göppingen (geup'ing-en), a town of Würtemberg, 22 miles E. S. E. Stuttgart. It is regularly built; contains a handsome church, town-house, old castle, and hospital; and has a mineral spring; manufactures of woolen and linen cloth, hats, paper, etc. Pop. (1905) 20,870.

Gorakhpur (gō-ruk-pör'), a town of Hindustan, Northwest Provinces, division of Benares, capital of the district of same name, on the left bank of the Rapti. It has considerable trade in grain and timber, sent down the Rapti to the Gorgra and the Ganges. Pop. 64,148.—The district has an area of 4598 square miles. It is generally flat, and traversed by numerous streams, of which the principal are the Rapti and larger Gandak.

Goramy, GOURAMI (gō-ra-mī', gō-ra-mi'), the Javanese name of a fish of the genus *Osphroměnus* (*O. olfax*), family Anabasidæ or climbing perches, a native of China and the Eastern Archipelago, but introduced into the Mauritius, West India Islands, and Cayenne on account of the excellence of its flesh, where it has multiplied rapidly. It is deep in proportion to its length, and the dorsal and anal fins have numerous short spines, while the first ray of the ventral is protracted into a filament of extraordinary length. It is one of the few fishes which build nests, which it does by interweaving the stems and leaves of aquatic plants.

Gordiacea. See *Nematelmia.*

Gordian Knot. See *Gordius.*

Gordianus (gor-di-ā'nus), M. ANTONIUS, the name of three Roman emperors, father, son, and grandson, Anglicized as *Gordian.* The first was born in 158 A.D., and had governed Africa for many years, when he was proclaimed emperor at the age of eighty. He associated his son with him in the empire, but six weeks later the son was killed in fighting against the rival emperor Maximinus, and the father, in an agony of grief, died by his own hand. The grandson was proclaimed emperor by the soldiers in Rome 238 A.D., although he was not more than fifteen years of age. He reigned six years, when he was assassinated by his soldiers at the instigation of Philip, prefect of the Prætorian guard.

Gordius (gor'di-us), in Greek legend, a Phrygian peasant, father of Midas, who was raised to the Phrygian throne in accordance with an oracle which declared to its Phrygian consulters that their seditions would cease if they elected as king the first man they met, mounted on a chariot, going to the temple of Zeus. This was Gordius, who, to evince his gratitude, consecrated his chariot to Zeus, and fastened the pole with so ingenious a knot that the oracle promised the dominion of the world to him who should untie it. Alexander the Great cut it with his sword, and to 'cut the Gordian knot' became a proverb.

Gordon (gor'don), FAMILY OF, a celebrated Scottish historical house, the origin of which is still wrapped up in a certain measure of obscurity. It is probable that the family came over to England with William the Conqueror, and at a subsequent period settled in Berwickshire, where a parish and village bear this name. The adhesion of Sir Adam Gordon, Justiciar of Lothian, to the cause of Bruce gave him estates on Deeside and the Spey Valley. The direct male line died out in the person of Sir Adam of Gordon, who fell in the battle of Homildon (1402). But, from his female and illegitimate descendants, a number of branches sprang up. His grandson was made Earl of Huntly (1445). The head of this branch was made marquis in 1599, and Duke of Gordon in 1684. It became extinct in 1836. The title Marquis of Huntly passed to a branch of the family which acquired the title of Earl of Aboyne in 1660. The earls of Sutherland, the barons of Lochinvar, the viscounts of Kenmure, and the earls of Aberdeen are all branches of the Gordon family. The title Duke of Gordon was revived in 1875, and given to the Duke of Richmond and Lennox.

Gordon, CHARLES GEORGE, a British soldier, known also as 'Chinese Gordon' and Gordon Pasha, was born at Woolwich in 1833, killed at Khartoum in 1885. He entered the Royal

Engineers in 1852, and served in the Crimea (1854-56). During the Taeping rebellion in China Gordon succeeded in completely crushing the revolt by means of a specially-trained corps of Chinese, exhibiting marvelous feats of skillful soldiership. On his return to England with the rank of colonel he was appointed chief engineer officer at Gravesend, where his military talents and philanthropy were conspicuously displayed. From 1874 to 1879 he was governor of the Soudan under the khedive. For a few months in 1882 he held an appointment at the Cape, and he had just accepted a mission to the Congo from the king of the Belgians, when he was sent to withdraw the garrisons detained in the Soudan by the insurgent mahdi. He was shut up in Khartoum by the rebels, and gallantly held that town for a whole year. A British expeditionary force under Lord Wolseley was despatched for his relief, but found great difficulty in the desert journey, and an advance corps sighted Khartoum on 24th January, 1885, only to find that the town had been captured by the mahdi two days before, and Gordon murdered. Gordon's character was marked by strong religious feelings, which in time became so intensified as to make him somewhat of a religious enthusiast and fatalist.

Gordon, Charles William ("Ralph Connor"), a Canadian clergyman and author, born in Glengarry, Ontario, September 13, 1860; studied at Toronto University and Knox College, Toronto, and was a Presbyterian missionary in the Rocky Mountains from 1890 to 1894, when he became minister of St. Stephen's, Winnipeg. His best known novels are *Black Rock* (1898), *The Sky Pilot* (1899), *The Man from Glengarry* (1901), *The Prospector* (1904), *The Doctor* (1906).

Gordon Bennett, a mountain, 15,000 feet, in Central Africa, in the Ruwenzon range, near the Albert Nyanza, first seen by Stanley in 1875.

Gordon, Lord George, son of Cosmo George, Duke of Gordon, born 1751; died in 1793. He entered when young into the navy, but left the service during the American war. He then became a member of the House of Commons. His parliamentary conduct was marked by a certain degree of eccentricity, and by his opposition to the ministry. A bill having been introduced into the house for the relief of Roman Catholics from certain penalties and disabilities, in June, 1778, Lord George headed an excited mob of about 100,000 persons, who went in procession to the House of Commons to present a petition against the measure. The dreadful riots which ensued led to his arrest and trial on the charge of high treason; but, no evidence being adduced of treasonable design, he was acquitted. In the beginning of 1788, having been twice convicted of libeling the French ambassador, the Queen of France, and the criminal justice of his country, he retired to Holland, but he was arrested, sent home, and committed to Newgate, where he passed the remainder of his life. He was undoubtedly of unsound mentality.

Gordon, John Brown, soldier, was born in Upson County, Georgia, in 1832; died in 1904. He became an infantry captain in the Confederate Army in 1861, served through the war with great distinction, being wounded eight times, and becoming major-general. He was elected to the United States Senate in 1873; resigned in 1880, and in 1886 he was elected Governor of Georgia. He served as senator again, 1891–97. He was chosen commander-in-chief of the United Confederate Veterans in 1900.

Gordon, Sir John Watson, a Scottish painter, and president of the Royal Scottish Academy, was born in Edinburgh in 1788; died in 1864. He applied himself almost exclusively to portrait-painting, in which he obtained great excellence. He was employed to paint the portraits of many of the most eminent men of the day, among whom we may mention Sir Walter Scott, Dr. Chalmers, De Quincey, etc.

Gordon, Patrick, a Scottish soldier, born 1635; died at Moscow in 1699. In 1661 he entered the Russian service, became a general, and rose high in favor with Peter the Great. He kept an interesting diary for the last forty years of his life, part of which has been published.

Gore, Thomas Peyor, statesman, born in Webster County, Mississippi, in 1870, lost the sight of his left eye at 8 and of the right eye at 11, by accidents, yet was graduated in a normal school in 1890, taught school 1890–91, was graduated in law at Cumberland University (Tenn.) and was admitted to the bar in 1892. He removed to Texas in 1895, was nominated for Congress by the People's Party in 1898, but defeated. He joined the Democratic party in 1899, removed to Lawton, Oklahoma, in 1901; was elected to the Territorial Legislature in 1902–05, and after an active canvass, in which he had blindness and poverty to contend with, he was elected United States Senator for a partial term in 1907, and re-elected in 1909.

Goree (gor-ē), a small island, or rather rock, belonging to France, on the coast of Africa, a little more than a mile from the southern shore of the promontory that forms Cape Verd. Pop. 1500.

Gorgas (gor'găs), WILLIAM CRAWFORD, assistant surgeon-general of the United States Army, born in Mobile, Alabama, October 3, 1854. He studied at the University of the South and at the Bellevue Hospital Medical College, New York. In 1880 he became a surgeon of the U. S. A. In 1898 he was appointed chief sanitary officer of Havana. Here he successfully combated yellow fever, 1898-1902. In 1904 he was appointed chief sanitary officer of the Panama Canal. Under his direction the sanitation of the Isthmus became a matter of intelligent administration.

Gorget (gor'jet; French, *gorge*, throat), a piece of body armor, either scale work or plate, for the protection of the throat. The *camail*, or throat covering of chain mail, which is sometimes called the gorget of mail, belonged more to the helmet than to the body armor.

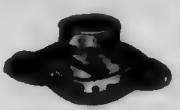


Plate Gorget.

Gorgias (gor'-ji-as), a Greek orator and sophist, born at Leontini in Sicily about 480 B.C. When about sixty years of age he was sent as ambassador to Athens. He was a popular teacher of rhetoric, and Plato named one of his dialogues after him. He is said to have reached the extraordinary age of 107 or 108 years. Two works attributed to him are extant *The Apology of Palamedes* and the *Encomium on Helena*, but their genuineness has been questioned.

Gorgons (gor'guns), in Greek mythology, three frightful goddesses whose names were Stheno, Euryăle, and Medusa. They were all immortal except Medusa. Their hair was said to be entwined with serpents, and they turned to stone all those who looked upon them. Medusa was killed by Perseus (which see).

Gorilla (go-ril'la), *Troglodytes Gorilla*, the largest animal of the ape kind. It attains a height of about 5½ feet, is found chiefly in the woody equatorial regions of the African continent, is possessed of great strength, has a barking voice, lives mostly in trees, and feeds chiefly on vegetable substances, as the fruit and cabbage of the palm-tree, the pawpaw, the banana, etc. The erect position is more readily assumed than in most other anthropoid apes, owing to the shape of the sole of the foot, which is not inverted, and is shorter and broader; but the ordinary gait is on all-fours. It has a ferocious and brutal cast of features, due to extremely prominent supra-orbital ridges and retreating forehead. Its great strength and ferocity make it the monarch of the forests it inhabits, even the lion shrinking from contests with it. Gorillas make a sleeping-place like a hammock, connecting the branches of the

Gorilla

sheltered and thickly-leaved part of a tree by means of the long, tough, slender stems of parasitic plants, and lining it with the broad, dried fronds of palms or with long grass. This hammock-like abode is constructed at different heights from 10 to 40 feet from the ground, but there is never more than one such nest in a tree. The gorilla has thirteen ribs, and in the proportion of its molar teeth to the incisors and in the form of its pelvis it approaches closely the human form. The Phœnician navigator Hanno found the name in use in the fifth century B. C. in W. Africa.

Göritz (gō'ritz). See *Görz*.

Gorkum (gor'kum; properly *Gorinchem*), a fortified town of the Netherlands, on the Linge, at its junction with the Merwede, the name given for a short distance to the river formed by the union of the Waal and the

Maas, 22 miles E. S. E. of Rotterdam. Pop. 11,855.

Gorky, Maxim (ALEXEI MAXIMOVITCH PYESHKOFF), the pen name of a Russian novelist, born in 1868, of a peasant family, spent his early life in tramping and working among the lowest grades of Russian life. He finally began writing, producing stories, novels, and plays which depicted with startling vividness life in the slums and among the tramps of Russia.

Görlitz (geur'lits), a town in the Prussian government of Liegnitz, province of Silesia, on the left bank of the Neisse. It is well built, having generally substantial houses, several large squares and spacious streets. Its industries include woolens, linens, and cottons, machinery, etc. Pop. 80,931.

Görres (geur'res), JAKOB JOSEPH VON, a distinguished German publicist and author, born at Coblentz in 1776; died at Munich in 1848. He began life with very advanced ideas, but ultimately his republican views became much modified, and he ended as an uncompromising Ultramontane R. Catholic. He taught in a school at Coblentz, and having studied Persian, he produced a translation of part of the *Shahnameh*. In 1814 he started the *Rheinische Merkur*, the organ of the German national movement against Napoleon, but it was suppressed in 1816. Owing to his support of Catholicism, he was appointed professor of history at Munich. He wrote on a great variety of subjects. Among the chief works are *Aphorisms on Art, Faith and Science, Mythological History of Asia, Christian Mysticism*, etc.

Gortschakoff (gor'chà-kov), PRINCE MICHAEL, a Russian general, born in 1792; died 1861. He took part as an artillery officer in the battle of Borodino in 1812, and served in the subsequent campaigns of the allies against the French. He took a prominent part in the Turkish war (1828-29); the Polish war (1831); the invasion of Hungary (1849); and in the war with Turkey and the western powers (1853-55). In the Crimea he held the command in Sebastopol during the siege. After the war he was made governor of Poland.

Gortschakoff, ALEXANDER MICHAELOWITCH, Russian diplomatist, brother of the preceding, was born in 1798; died in 1883. He entered the diplomatic service in 1824 as secretary to the Russian embassy in London. His experience in diplomatics was extended in Vienna, Florence, Stuttgart, etc., and he showed considerable dexterity in securing the neutrality of Austria during the Crimean war. In 1856 he became minister of foreign affairs, and in 1863 chancellor of the empire. He was a prominent member of the Berlin Congress, 1878.

Goruckpore (go-ruk'pōr). See *Gorakhpur*.

Gory Dew, a name commonly given to one of the simplest forms of vegetation (*Palmella cruenta*), consisting only of a number of minute cells, which appear on the damp parts of some hard surfaces in the form of a reddish slime. It is an alga nearly allied to the plant to which the phenomenon of red snow is due.

Görz, GORITZ (geurts, geurits), a town of Austria, province of Görz and Gradisca, near the head of the Adriatic, 23 miles N. N. W. of Trieste. It consists of the high town on a mountain slope and the new town, on the left bank of the river Isonzo. It is part of the Italia Irredenta (see *Irredentism*) and was an objective of the Italian offensive begun in early August, 1916, during the European war. It was captured from the Austrians, the king of Italy entering the town August 10. It was held by the Italians till October 28, 1917, when it was again taken by Austria. The population before the war was 31,000. Following the defeat and dismemberment of Austria-Hungary (q. v.) in 1918, Görz (in Italian, GORIZIA) became part of Italy.

Goschen (gō'shen), GEORGE JOACHIM, politician and financier, of German extraction, born in London in 1831; died in 1904. He became a member of Parliament in 1863 and of the Russell cabinet in 1865, and was made chancellor of the exchequer in Lord Salisbury's cabinet. He was the author of a well-known work on the *Theory of Foreign Exchanges*.

Goshawk (gos'hak), a raptorial bird of the hawk kind, belonging to the genus *Astur* (*A. palumbarius*), and formerly much used in falconry. This bird flies low, and pursues its prey in a line after it, or in the manner called 'raking' by falconers. The female was generally flown by falconers at rabbits, hares, etc., and the larger-winged game, while the male was usually flown at the smaller birds, and principally at partridges.

Goshen (gō'shen), in ancient geography, a district of Egypt which Joseph procured for his brethren.

Goshen, a city, county seat of Elkhart County, Indiana, 110 miles E. of Chicago. Its products include furniture, rubber goods, underwear, bags, veneers, hardwood lumber, condensed milk, ladders, gas engines, etc. Pop. 11,000.

Goslar (gos'lar), an interesting old town of Prussia in Hanover, 26 m. southeast of Hildesheim, on the north side of the Harz, at the foot of the Rammelsberg. It once ranked as a free imperial city, has remains of its old fortifications, and some old buildings, including part of a palace of the German emperors, dating from the eleventh century. There is also a town-house of the fifteenth century. The inhabitants are chiefly engaged in the copper, silver, and other mines in the neighborhood. Pop. 17,817.

Gospel (gos'pel). The Greek word for which *gospel* has been used as the equivalent is *evangelion*, or rather *euaggelion*, a good or joyful message. In the New Testament it denotes primarily the glad tidings respecting the Messiah and his kingdom—this was emphatically the *gospel* (Anglo-Saxon, *gód-spell*, good tidings). It was quite naturally employed as a common title for the historical accounts which record the facts that constitute the basis of Christianity. It may be fairly said that the genuineness of the four narratives written by Matthew, Mark, Luke, and John rests upon good evidence. They were all composed in the latter half of the first century; those of Matthew and Mark some years before the destruction of Jerusalem; that of Luke about the year 64; and that of St. John about the close of the century. Before the end of the second century we have abundant evidence that the four Gospels, as one collection, were generally used and accepted. While the early existence of these Gospels has been admitted, much discussion has taken place regarding their origin, and their relation one to another. They seem to have been viewed as so many original and independent sources, each one as much so as the others. The critical spirit of modern times has refused to halt at this point; it has sought to get at, so to speak, the genealogy of the several Gospels with their different degrees of relationship. Each of the four Gospels has in turn been assumed by different critics to be the first out of which the others arose; and the theory has been more than once propounded of some prior, more strictly original document, no longer extant, which formed the common basis of them all. The supposition of an original document from which the three synoptical Gospels (those of Matthew, Mark, and Luke) were drawn, each with more or less modification, would naturally occur to those who rejected the notion that the evangelists copied from each other. The fourth Gospel, as the narrative coincides with that of the other three in a few passages only, is not drawn into the discussion, and the received explanation is the only satisfactory one with respect to it, namely, that John, writing last, had seen the other Gospels, and purposely abstained from writing anew what had been sufficiently recorded. Another conjecture is that the Gospels sprang out of a common oral tradition. According to this view of the origin of the Gospels, that of Mark, if not the oldest in composition, is yet probably the most direct and primitive in form; it is the testimony delivered by Peter, possibly with little alteration. The Gospels of Matthew and Luke, again, 'represent the two great types of recension to which it may be supposed that the simple narrative was subjected. Luke represents the Hellenic, and Matthew the later Hebraic form of the tradition, and in its present shape the latter seems to give the last authentic record of the primitive Gospel.' A comparison of the three synoptical Gospels yields some interesting results. If we suppose the history they contain to be divided into sections, in forty-two of these all the three narratives coincide; twelve more are given by Matthew and Mark only, five by Mark and Luke only, and fourteen by Matthew and Luke. To these must be added five peculiar to Matthew, two to Mark, and nine to Luke. But this applies only to general coincidence as to the facts narrated; the number of passages either verbally the same, or coinciding in the use of many of the same words, is much smaller. Briefly stated the critical result is as follows:—There is a singular coincidence in substance in the three synoptical Gospels. This agreement would be of no difficulty without the differences; it would only mark the one divine source from which they were all derived. On the other hand, the difference of form and style, without the agreement, would offer no difficulty, since there may be a substantial harmony between accounts that differ greatly in mode of expression, and the very difference might be a guarantee of independence. Several biographies of Jesus and the holy family written by unknown authors of the second, third, and later centuries are known as *Apocryphal Gospels*. They have no historical nor doctrinal value whatever. The titles of the best known of these are: *The Gospel of James*, *The Gospel of Joseph the Carpenter*, *The Gospel of Thomas*, *The Gospel of Nicodemus*, *The Acts of Pilate*, and his *Letter to Tiberias*, etc.

Gosport (gos'pōrt), a town and fortified seaport of England, county of Hants, on the west side of the

entrance to Portsmouth harbor, and directly opposite the town of Portsmouth. Besides containing infantry barracks, it is an important naval depôt, including a victualing yard, large government factories, and Haslar Hospital, the chief establishment in Britain for invalided sailors. Pop. (1911) 33,301.

Gossamer (gos'a-mẽr) is the name of a fine filmy substance, like cobweb, which is seen to float in the air in clear days in autumn, and is most observable in stubble-fields, and upon furze and other low bushes. This is formed by several kinds of small spiders, and only, according to some, when they are young.

Gosse (gos), EDMUND WILLIAM, son of Philip Henry Gosse, was born in London in 1849. He was appointed assistant in the British Museum in 1867, translator to the Board of Trade in 1875; specially studied the northern literatures, and published *Northern Studies*, consisting of critical essays on Scandinavian, Dutch, and German literature. He also published several volumes of poetry and critical essays, and was Clark Lecturer in English literature at Trinity College, Cambridge, in 1884-89.

Gosse, PHILIP HENRY, naturalist, was born to Worcester, England, in 1810; died in 1888. From 1827 to 1835 he was resident in Newfoundland, and afterwards traveled through Canada and the United States, making all the time large collections of insects, etc. In 1844 he visited Jamaica. Among his many works are: *The Canadian Naturalist, The Birds of Jamaica, A Naturalist's Sojourn in Jamaica, The Aquarium, Marine Zoology, Life, Actinologia Britannica, Romance of Natural History*, etc., besides many contributions to the learned societies.

Göteborg, or GÖTHEBORG (yeu'te-borg). See *Gottenburg*.

Gotha (gō'tà), a town of Germany, capital of the Duchy of Saxe-Coburg-Gotha, on the Leine, 14 miles W. S. W. Erfurt, is well built, with fine environs and suburbs. The principal building is the ducal castle or palace, occupying the crown of the height on which the town is situated. This town alternates with Coburg as a residence of the dukes of the duchy. It contains a museum, a picture-gallery, a valuable cabinet of engravings, a library of 200,000 vols. and 6000 MSS., of which 2500 are Arabic and 400 Persian and Turkish; and a collection of over 80,000 coins and medals. The manufactures consist chiefly of woolen, linen, and cotton tissues, porcelain, musical instruments, and various articles in gold and silver. Pop. (1910) 39,553.

Gotha (gō'ta), ALMANACH DE. See the article *Almanac*.

Gotham (gō'tham), a parish and village in the county of and 7 miles S. W. of Nottingham, England. It has an old reputation for folly, but the stories told of the 'wise men of Gotham' are widespread. Washington Irving applied the name to New York.

Gothard (goth'ard), ST., a mountain group of Switzerland, on the confines of the cantons Tessin and Uri, belonging to the Lepontine or Helvetian Alps, which it connects with the Bernese Alps. It forms a kind of central nucleus in the great watershed of Europe. Its culminating point has a height of 10,600 feet. The Col of St. Gothard, at its summit level, where the Hospice stands, is 6808 feet high. Over it an excellent carriage road was completed in 1832. A railway tunnel has been pierced through this mountain group between Göschenen on the north and Airolo on the south, thus directly connecting the railway system of North Italy with those of Switzerland and Western and Central Germany. This tunnel has a total length of 16,295 yards, or rather more than 9¼ miles. Its construction, begun in 1872, was completed in 1881, and it was opened for traffic early in 1882. Its total cost was about $12,000,000.

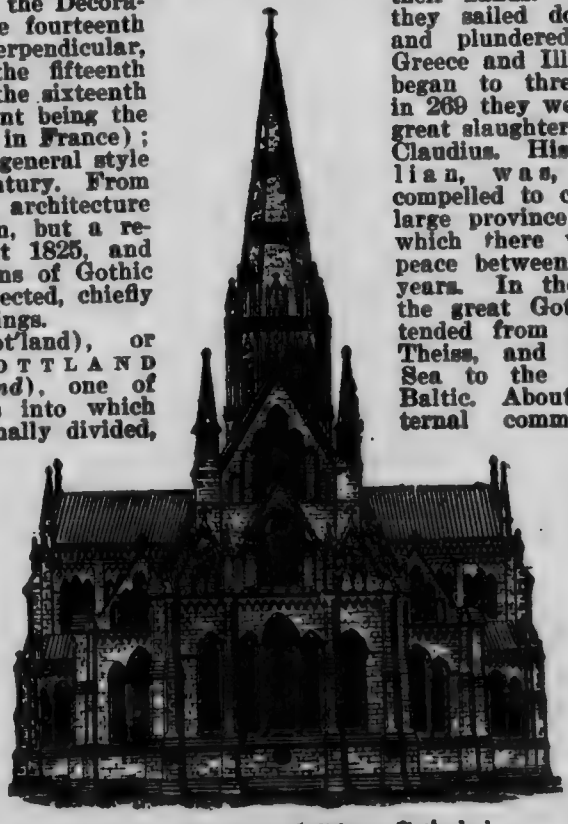
Gothenburg System. See *Gottenburg*.

Gothic Architecture (goth'ik), a term applied to the various styles of pointed architecture prevalent in Western Europe from the middle of the twelfth century to the revival of classic architecture in the sixteenth. The term was originally applied in a depreciatory sense to all the styles which were introduced by the barbarians who overthrew the Roman Empire. But the invention or introduction of the pointed arch gave birth to a new style of architecture, to which the name Gothic is now properly restricted. The chief characteristics of Gothic architecture are:—The predominance of the pointed arch and the subserviency and subordination of all the other parts to this chief feature; the tendency through the whole composition to the predominance and prolongation of vertical lines; the absence of the column and entablature of classic architecture, of square edges and rectangular surfaces, and the substitution of clustered shafts, contrasted surfaces, and members multiplied in rich variety. This style originated in France and spread very rapidly to England, Germany,

Italy, Spain, and the Scandinavian countries. In England it was introduced by William of Sens, who built Canterbury Cathedral in 1174, and there followed an independent course of development. The Gothic architecture of Britain has been divided into four principal epochs—the Early English, or general style of the thirteenth century; the Decorated, or style of the fourteenth century; the Perpendicular, practiced during the fifteenth and early part of the sixteenth century (Flamboyant being the contemporary style in France); and the Tudor, or general style of the sixteenth century. From that time Gothic architecture declined in Britain, but a revival set in about 1825, and many fine specimens of Gothic have since been erected, chiefly ecclesiastical buildings.

Gothic Architecture.

a, b, Early English Windows. c, Transition. d, Geometrical. e, Perfect Decorated. f, g, Perpendicular.



Gothic Architecture.—Salisbury Cathedral.

Gothland (got'land), or GOTTLAND (Swedish, *Götaland*), one of the large sections into which Sweden was originally divided, and including the portion south of lat. 59° 20′ N.

Goths, an ancient Teutonic tribe occupying when first known to history the region adjacent to the Black Sea north of the lower Danube. A people of similar name is mentioned by Tacitus as dwelling south of the Baltic, and *Geats* or *Gauts* are known to us from the Anglo-Saxon poem *Beowulf* as inhabitants of Southern Sweden; but there is no necessary connection between these and the Goths proper. About the middle of the third century these began to encroach on the Roman Empire. Having seized the Roman province of Dacia, they were assailed by Decius, whom they twice defeated. In 253 they captured Trebizond, where a large fleet of ships fell into their hands. With this force they sailed down the Ægean and plundered the coasts of Greece and Illyria. They now began to threaten Italy, but in 269 they were defeated with great slaughter by the Emperor Claudius. His successor, Aurelian, was, notwithstanding compelled to cede to them the large province of Dacia, after which there was comparative peace between them for many years. In the fourth century the great Gothic kingdom extended from the Don to the Theiss, and from the Black Sea to the Vistula and the Baltic. About the year 369 internal commotions produced the division of the Gothic kingdom into the kingdom of the Ostrogoths (eastern Goths) and the kingdom of the Visigoths (western Goths). In 396 Alaric, king of the Visigoths, made an irruption into Greece, laid waste the Peloponnesus, and became prefect of Illyria. He invaded Italy and sacked Rome in 409, and a second time in 410. After his death (in 410) the Visigoths succeeded in establishing a new kingdom in the southern parts of Gaul

and Spain, of which, towards the end of the fifth century, Provence, Languedoc, and Catalonia were the principal provinces, and Toulouse the seat of government. The last king, Roderick, died in 711 in battle against the Moors, who had crossed from Africa, and subsequently conquered the Gothic kingdom. After the fall of the Western Roman Empire, by the invasion of Odoacer in 476, the Eastern emperor, Zeno, persuaded Theodoric, king of the Ostrogoths, to invade Italy in 489. The Goth became king of Italy in 493, and laid the foundation of a new Ostrogothic kingdom, which, together with Italy, comprised Rhætia (a part of Switzerland and the Tyrol), Vindelicia (part of Bavaria and Swabia), Noricum (Saltzburg, Stiria, Carinthia, Austria), Dalmatia, Pannonia (Further Hungary, Slavonia), and Dacia beyond the Danube (Transylvania, Wallachia). This kingdom came to an end in 554. Subsequently the Goths both here and in Spain entirely disappeared as a distinct people.

Christianity appears to have early taken root among the Goths settled in Moesia, a Gothic bishop being mentioned as present at the council of Nicæa (325). Their form of Christianity was Arianism, which was patronized by their protector Valens, and certainly adopted by their bishop, Ulfilas. The introduction of Christianity among the Goths, and the circumstance of their dwelling near and even among civilized subjects of the Roman Empire, greatly contributed to raising them in civilization above the other German tribes. Bishop Ulfilas, in the fourth century, translated, if not the whole, at least the greater part of the Bible into Moeso-Gothic, using an alphabet which he formed out of those of the Greeks and Romans. Unfortunately only a small portion of this translation has come down to us; but this is quite sufficient to enable us to form an opinion of the language at that time, and is of the highest value from a philological point of view. Besides this translation there exist a few other monuments of the language, which are, however, of minor importance. Gothic was one of the Teutonic tongues, being accordingly a sister of Anglo-Saxon and English, German, Dutch, Danish, etc. Being committed to writing earlier than any other Teutonic language, Gothic exhibits peculiarities entirely its own, and hence its value in the study of Teutonic philology in general. It is richer in inflections than any other of the Teutonic tongues. Swedish is the least like the Gothic of all the Germanic dialects, and the probability is that the Goths migrated to Scandinavia from the country on the east of the Vistula long before they proceeded southward. See *Ulfilas*.

Gottenburg, or GOTHENBURG (got'-en-burg; Swedish, *Göteborg*), a seaport town in Sweden, the second in respect of population and trade, capital of the län of the same name, situated at the mouth of the Göta, in the Kattegat, 255 miles W. S. W. Stockholm, intersected by canals. It is one of the best built towns in Sweden, and the seat of a bishopric. It has manufactures of sail-cloth, cotton, and other goods, and possesses shipbuilding yards, tobacco factories, breweries, sugar refineries, etc. The trade is very extensive, the harbor being excellent and always free from ice. It has a good depth of water, is defended by forts, and there is a drydock cut in

the solid rock. The completion of the Göta canal and railway facilities have increased its importance. Among social reformers the town is noted for its licensing system, known as the 'Gottenburg system,' under which the public-house licenses are controlled by the municipality and granted to a company, which, after paying the expenses of management with 6 per cent. annual interest on the shareholders' capital, makes over the profits to the town treasury. This plan has been in force since 1865, and has been experimented with, less successfully, in some other localities. Pop. 177,200.

Gottfried (got'frēd) VON STRASBURG. See *Godfrey of Strasburg*.

Göttingen (gent'ing-en), a town of Prussia, province of Han-

over, on the Leine, 50 miles S. S. E. Hanover. It is a place of great antiquity, and is generally well built, having wide and spacious streets. Its chief attraction is the university, founded in 1734 by George II of England and elector of Hanover, opened in 1737, and which has a European reputation. It has an average attendance of over 1000 students. Connected with the university are a museum, an observatory, an anatomical theater, botanical garden, and a library possessed of 500,000 printed volumes and 5000 MSS. The manufactures comprise woolens, chemicals, scientific instruments, etc. Pop. (1910) 37,594.

Gottland, or GOTHLAND (got'land), an island of the Baltic, belonging to and 55 miles east of the coast of Sweden. It is of irregular shape, and has an area of 1200 sq. miles. The coast is for the most part rocky and deeply indented. The interior consists of a limestone plateau, intersected near its center by a range of heights from 200 to 300 feet above the sea. The soil is fertile. The chief town, Wisby, was once a flourishing member of the Hanseatic League. Pop. 52,781.

Gottsched (got'shet), JOHANN CHRISTOPH, a German writer, born in 1700; died in 1766. He became professor of eloquence and poetry, and afterwards of logic and metaphysics at Leipzig; and for many years was dictator in Germany in matters of literary taste. In 1728 he published the first sketch of his *Rhetoric*, and in 1729 his *Kritische Dichtkunst* ('Critical Art of Poetry'). Both these works condemn the disfigurement of the language by the use of foreign words, and oppose the bombast in poetry then prevailing.

Gottschalk (got'shâlk), LOUIS MOREAU, musician, was born in New Orleans, Louisiana, in 1829. His marked musical ability induced his father to send him to Paris to receive further education. In 1848 his series of public concerts in Paris met with much success. He afterwards appeared in the United States and in Mexico and South America. He died in Brazil in 1869.

Gouda (gou'dâ), a town of Holland, in the province of South Holland, 11 miles northeast of Rotterdam, separated into two unequal parts by the Gouwe, which here unites with the Ijssel. The town is composed of neatly built houses, and is intersected by numerous canals. The great marketplace is the largest in Holland. The church of St. John is noted for its organ and its painted glass windows, said to be among the finest in Europe. There are pipe-works, potteries, and breweries, and manufactories of stearine candles, yarn, and cigars. Gouda is a great market for cheese, sold under the name of Gouda cheese. Pop. 22,308.

Goudimel (gö-di-mel), CLAUDE, a French musical composer, born in 1510; killed during the St. Bartholomew massacres at Lyons in 1572. Palestrina was one of his pupils at Rome. His most important work is a setting of the French version of the Psalms by Marot and Beza. Some of these tunes are still used by the French Protestant Church and by the German Lutherans.

Gough (gof), HUGH, VISCOUNT, an English general; born at Woodstown, County Limerick, in 1779; died 1869. He joined the army in 1794, and was present the year after at the capture of the Cape of Good Hope. He served in Spain in 1809-13; was made major-general in 1830, and sent to India as commander of the Mysore division of the army in 1837. He commanded the land forces in the Chinese war of 1841; was made baronet, and returned to India as commander-in-chief; suppressed the revolt of the Mahrattas, 1843; and commanded in the Sikh wars of 1845-48. He was superseded by Sir Charles Napier in 1849. He was made baron in 1846; created viscount and pensioned, 1849; field-marshal, 1862.

Gough, JOHN BARTHOLOMEW, temperance orator, born at Sandhurst, Kent, in 1817; died in 1886. He attained a great celebrity as a fervid orator on his special subject in the United States and elsewhere, and published his autobiography, orations, and a volume of sketches, *Sunlight and Shadow*.

Goulburn (göl'bèrn), a city of New South Wales, in Argyle County, 134 miles S. W. of Sydney, well laid out with broad streets lined with substantial buildings. Pop. 10,916.

Gould (göld), AUGUSTUS ADDISON, naturalist, born at New Ipswich, New Hampshire, in 1805; died in 1866. He graduated in medicine at Harvard College in 1830, and while practicing engaged in scientific study, devoting himself to botany, zoology and conchology. In the latter he became an authority of world-wide eminence. He aided Sir Charles Lyell in his geological investigations in the United States. He was the author of valuable works on conchology and other subjects.

Gould, BENJAMIN APTHORP, astronomer, born at Boston, Massachusetts, in 1824; died in 1896. Graduating at Harvard in 1844, he pursued the study of science abroad, and in 1849 was ap-

pointed on the United States Coast Survey, when he devised methods to determine longitude by aid of the telegraph. He was director of the national observatory at Cordova, Argentina, 1870-85, completing there three extensive catalogues of stars, and conducting observations in meteorology and climatology. His *Uranometry of the Southern Heavens* is a work of great value.

Gould, HELEN MILLER, philanthropist, daughter of Jay Gould, was born in New York in 1868. Inheriting ample means from her father, she became distinguished for her discriminative gifts for charitable and educational purposes. During the war with Spain she became an active worker in the Woman's National War Relief Association, and contributed liberally to its funds, and for other purposes connected with the war. Since then she has given much for educational purposes, including $100,000 to the University of N. Y. She married Finley J. Shepard, January 22, 1913.

Gould, JAY (JASON), financier, was born in Roxbury, Delaware County, New York, in 1836; died in 1892. He was one of the first of the daring American speculators and one of the most unscrupulous of them all. By his unusual ability as a stock-dealing financier and his audacious schemes and methods, he accumulated an enormous fortune for his era, valued at over $72,000,000.

Gould (göld), JOHN, ornithologist, born at Lyme, Dorsetshire, in 1804; died at London in 1881. Originally a gardener, he was appointed curator to the Zoological Society's Museum in 1827, and henceforward his whole life was devoted to the study of birds. His chief works—all magnificently illustrated—are: *A Century of Birds from the Himalayan Mountains*, 1831; *The Birds of Europe*, 5 vols. folio, 1832-37; *The Birds of Australia*, 7 vols. folio, 1840-48, with 3 supplementary volumes, 1850-52; *The Birds of Great Britain*, 5 vols., 1862-73, etc., besides a number of monographs on the humming-birds, the trogons, etc.

Gounod (gö-nō), CHARLES FRANÇOIS, a French operatic composer, born at Paris in 1817; studied at the Conservatoire under Halévy, Lesueur, and Pauer, and afterwards in Italy. His first important work was *Faust* (1859), which raised him to a high rank among composers. Other operas followed—*Mireille* (1864), *Romet et Juliette*, *Cinq Mars* (1877), *Polyeucte* (1878), and later, *Charlotte Corday*. He wrote also a *Messe Solennelle*, a motet *Gallia*, and other choral works and songs; his oratorios *Redemption* (1882) and *Mors et Vita* (1885), and a Mass for the Jeanne D'Arc festival (1887), were popular. He died in 1893.

Goura (gō'ra), a genus of large-sized pigeons, natives of the Papuan Archipelago, comprising about six species known as crowned pigeons, and remarkable for their great size and the open erect crest with which the head is adorned. They pass most of the time on the ground, feed on fruits, and build their nests on the lower branches of trees. They have a stately bearing, harmoniously-colored plumage, and are in high esteem for the table.

Gourami. See *Goramy*.

Gourd (görd), the popular name for the species of *Cucurbita*, a genus of plants of the nat. order Cucurbitaceæ. The same name is given to the different kinds of fruit produced by the various plants of this genus. These are held in high estimation in hot countries; they attain a very large size, and most of them abound in wholesome, nutritious matter. The *C. Pepo*, or pumpkin, acquires sometimes a diameter of 2 feet.

Flower and Fruit of Squash (*Cucurbita Melopepo*).

The *C. Melopepo*, or squash, is cultivated in America as an article of food. The *C. Citrullus*, or watermelon, serves the Egyptians for meat, drink, and physic, and is largely grown in the United States. The *C. aurantia*, or orange-fruited gourd, is cultivated only as a curiosity, and is a native of the East Indies. The *Lagenaria vulgaris*, or bottle gourd, a native both of the East and West Indies, is edible, and is often 6 feet long and 18 inches in circumference. The outer coat or rind serves for bottles and water-cups.

Gourd-tree. Same as *Calabash-tree*.

Gourock (gö'rok), a town of Renfrewshire, Scotland, on the Firth of Clyde, 2 miles west of Greenock. It is a favorite watering-place, yachting station, and has a pier for steamers. Pop. 5261.

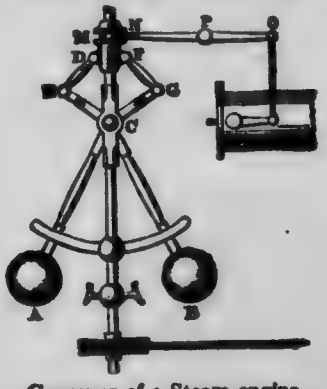
Gout, a form of arthritis, a constitutional disorder giving rise to paroxysms of acute pain with a specific form of inflammation, appearing after puberty, chiefly in the male sex, and returning after intervals. It is very often preceded by, or alternates with, disorder of the digestive or other internal organs, and is generally characterized by affection of the first joint of the great toe, by nocturnal exacerbations and morning remissions, and by vascular plethora; various joints, organs, or parts becoming affected after repeated attacks without passing into suppuration. It may be acquired or hereditary. In the former case it rarely appears before the age of thirty-five; in the latter, it is frequently observed earlier. Gout was formerly believed to be due to an excess of uric acid, but recent researches point to an infective origin, the source of the toxæmia being the digestive tract. Indolence, inactivity, and too free use of tartarous wines, fermented liquors and very high-seasoned and nitrogenous food are the principal causes which give rise to this disease. Gout is also called, according to the part it may affect, *Podagra* (in the feet), *Gonagra* (in the knees), *Chiragra* (in the hands), etc. It may be acute or chronic, and may give rise to concretions, which are chiefly composed of urate of soda. It is a disease very difficult to cure, as its regular attacks usually occur late in life, when the habits of indulgence which are adverse to its cure have become fixed. Strict regulation of the habits of life is one of the most important elements in the treatment of gout.

Gout-weed. See *Bishop-weed.*

Govan (guv'an), a town of Scotland, county of Lanark, on the left bank of the Clyde, to the west of Glasgow, of which it forms a suburb. It is the site of extensive shipbuilding yards, engineering works, dyeworks, etc. Pop. (1911) 89,725.

Government (guv'ern-ment) is a word used in common speech in various significations. It denotes the act of governing, the persons who govern, and the mode or system according to which the sovereign powers of a nation, the legislative, executive, and judicial powers are vested and exercised. Aristotle classified the forms of government into three classes: 1st, Monarchy, or that form in which the sovereignty of the state is vested in one individual; 2d, Aristocracy, or that in which it is confided to a select portion of the community supposed to possess peculiar aptitude for its exercise; and 3d, Democracy, or that in which it is retained by the community itself, and exercised, either directly, as in the small republics of ancient Greece, or indirectly, by means of representative institutions, as in the constitutional states of modern times. Each of these forms if brought into existence by the general will of the community, maintained by its consent, and employed for its benefit, is said to be a legitimate government. But each of these legitimate forms was considered by the ancients to be liable to a particular form of corruption. Monarchy had a tendency to degenerate into tyranny, or a government for the special benefit of the single ruler; aristocracy became oligarchy; and democracy degenerated into ochlocracy or mob rule. Through each of these various forms, each legitimate form being followed by its corresponding perverted form, government was supposed to run in a perpetual cycle; the last form, ochlocracy, being followed by anarchy. As a means of avoiding these evils, a mixed government is supposed to have been devised. The best species of mixed government was believed by Aristotle to be a union of aristocracy and democracy. The most remarkable instance of this form is, however, supposed to be seen in that balance of powers which forms the essence of the British constitution. The most remarkable instance of democratic government is the federal republic of the United States. See *Aristocracy, Democracy, Monarchy, Oligarchy, Republic, etc.*

Governor (guv'ėr-nur), a contrivance in mills and machinery for maintaining a uniform velocity with a varying resistance. A common



Governor of a Steam-engine.

form of steam-engine governor consists of a pair of balls (A B) suspended from a vertical shaft kept in motion by the engine. When the engine goes too fast the

balls fly farther asunder, and depress the end of a lever (N P O), which partly shuts a throttle-valve, and diminishes the quantity of steam admitted into the cylinder; and on the other hand, when the engine goes too slow, the balls fall down towards the spindle and elevate the valve, thus increasing the quantity of steam admitted into the cylinder. By this ingenious contrivance, therefore, the quantity of steam admitted to the cylinder is exactly proportioned to the resistance of the engine, and the velocity kept constantly the same. A similar contrivance is employed in mills to equalize the motion of the machinery. When any part of the machinery is suddenly stopped, or suddenly set going, and the moving power remains the same, an alteration in the velocity of the mill will take place, and it will move faster or slower. The governor is used to remedy this.

Governor's Island, an island in New York harbor, on which is Fort Columbus, headquarters of the Military Department of the East; also a small island at the main entrance of Boston Harbor, on which is Fort Winthrop.

Gower (gou'ẽr), JOHN, an early English poet, a contemporary and friend of Chaucer, born about 1320;

John Gower.

died in 1408. He was liberally educated, and was a member of the society of the Inner Temple. He appears to have been in affluent circumstances, as he contributed largely to the building of the conventual church of St. Mary Overy, in Southwark. His chief works are his *Speculum Meditantis*, *Vox Clamantis*, and *Confessio Amantis*, of which the first was a moral tract relative to the conjugal duties, written in French rhymes (now lost); the second a metrical chronicle of the insurrection of the commons under Richard II, in Latin elegiac verse; and the third an English poem in eight books, containing 30,000 lines, relative to the morals and metaphysics of love, one of the earliest products of the English press, being printed by Caxton in 1483.

Gowrie (gou'rẽ) CONSPIRACY, one of the strangest episodes in Scottish history, took place in August, 1601. King James VI while hunting in Falkland Park, Fifeshire, was asked by Alexander Ruthven (brother of the Earl of Gowrie) to accompany him to Gowrie House, near Perth, on the pretext that they had caught a Jesuit with an urn of foreign golden pieces hid under his cloak. On arriving at Gowrie House an attempt was made on the life or liberty of the king, but an alarm being raised, both the Ruthvens were slain, and James with difficulty escaped, as the Gowries were very popular with the inhabitants of Perth.

Goyanna (gō-yän'a), a city of Brazil, prov. of Pernambuco, 40 miles N. W. of the port of Recife or Pernambuco. Commerce in cotton, sugar, rum, hides, timber, castor-oil, etc. Pop. about 15,000.

Goyaz (gō-yäsh'), an inland province of Brazil, area 288,462 square miles. Chief town, Goyaz. The principal occupation of the inhabitants is cattle rearing and agriculture. Gold was formerly plentiful, and diamonds and other precious stones have been found. Pop. 260,395. The chief town, formerly called Villa Boa, has a cathedral, government palace, etc. Pop. 10,000.

Gozo, or Gozzo (got'sō), an island of the Mediterranean, belonging to Britain, about 4 miles N. W. of Malta; length, 9 miles; breadth, 5 miles; area, about 40 square miles. A good deal of grain and fruit is raised; but the most important crop is cotton. Cattle of superior quality are reared. The chief town, Rabato, contains about 5000, and the whole island about 22,000 inhabitants.

Gozzi (got'sē), CARLO, an Italian dramatist, born at Venice in 1722; died in 1806. His principal work consists of a series of dramas based on fairy tales, which obtained much popularity, and were highly praised by Goethe, Schlegel, De Staël, Sismondi, etc.

Gozzoli (got'so-lē), BENNOZO, an Italian painter, born at Florence in 1424; died some time after 1496. He was a pupil of Fra Angelico, and wrought at Florence, Rome, Orvieto, and Pisa. His name is specially identified with the great series of mural paintings in the Campo Santo, at Pisa, consisting of 24 subjects from the Old Testament,

from the *Invention of Wine by Noah* to the *Visit of the Queen of Sheba to Solomon.*

Graaff-Reinet (gräf-rī'net), a town of Cape Colony, capital of a division of the same name, the oldest and largest town in the midland district of the colony. There are churches and schools of the English Episcopalian and the Dutch Reformed denominations, a public library, and a college. It is regularly laid out with streets at right angles, the intervening squares being filled up with vineyards and gardens. Pop. about 6000.

Graafian-Vesicles (graf'i-an), in anatomy, numerous small, globular, transparent follicles found in the ovaries of mammals. Each follicle contains one ovum, which is expelled when it reaches maturity. Small at first, and deeply embedded in the ovary, they gradually approach the surface, and finally burst and discharge the ovum.

Graal. See *Grail.*

Gracchus (grak'kus), a Roman family of the Sempronian gens, several members of which have become historical. TIBERIUS SEMPRONIUS GRACCHUS, a general of the Second Punic war, was consul 215 B.C., defeated Hanno 214 B.C., and was killed 212 B.C.—Another TIBERIUS SEMPRONIUS GRACCHUS became consul 178 B.C., and again 163 B.C. He married Cornelia, a daughter of Scipio Africanus, and was the father of the two most celebrated Gracchi, TIBERIUS SEMPRONIUS and CAIUS, the former born about 169 B.C., killed 133 B.C.; the latter born 159 B.C., killed 121 B.C. The brothers having lost their father early, received from their mother Cornelia a careful education. At a more advanced age their minds were formed and ennobled by the Greek philosophy. Tiberius early made himself conspicuous in the military service. Under the command of his brother-in-law, the younger Scipio, he served at the siege of Carthage. While he was yet a mere youth he was received into the College of Augurs—an honor usually conferred only upon distinguished statesmen. He was subsequently quæstor to the Consul Mancinus, and was employed in the Numantian war, in which he greatly distinguished himself by the conclusion of a treaty by which he saved the lives of 20,000 men who were entirely at the mercy of the Numantines. This treaty was, however, repudiated by the Romans, but it increased his popularity immensely. In 133 B.C. he offered himself as a candidate for the tribuneship, which office rendered his person inviolable so long as he was invested with it, and placed him in a situation to advance his great plans for the improvement of the condition of the people in a legal way. His first efforts were directed to a reform of the Roman land system, by the restoration or enforcement of the old Licinian law, which enacted that no one should possess more than 500 acres of the public domains, and that the overplus should be equally divided among the plebeians. This law, which was now called, after Gracchus, the *Sempronian*, or, by way of eminence, the *agrarian law*, he revived, but with the introduction of several softening clauses. He was violently opposed by the aristocracy and the tribune Marcus Octavius, whose veto retarded the passage of the bill. Tiberius, however, by exerting all the prerogative of his office, managed to pass his bill, and three commissioners were appointed to carry it into execution, namely, Tiberius himself, his brother Caius, and his father-in-law Appius Claudius. Soon after this Attalus, king of Pergamus, died, bequeathing his treasures to the Roman people. Tiberius proposed that this bequest should be divided among the recipients of land under the new law, and to give the popular assembly instead of the senate the management of the state. But fortune turned against him; he was accused of having violated his office; of aspiring to be king; and at the next election for the tribuneship he was slain, with 300 of his followers, at the entrance to the Temple of Fides. Ten years after the death of his brother Tiberius, the younger Gracchus obtained the tribuneship. In the discharge of his office he first of all renewed his brother's law, and revenged his memory by expelling many of his most violent enemies from the city. Several popular measures gained him great favor with the people, but the intrigues of the nobles ultimately caused his fall. Livius Drusus, a tribune gained over to their interests, had the art to withdraw the affections of the populace from Caius by making greater promises to them, and thus obtained a superior popularity for himself and the senate. Hence it resulted that Caius did not obtain a third tribuneship, and Opimius, one of his bitterest enemies, was chosen to the consulate. A tumult, in which a lictor of Opimius was killed, gave the senate a pretence for empowering the consuls to take strong measures. Opimius made an attack upon the supporters of Gracchus with a band of disciplined soldiers. Nearly 3000 were slain, and Gracchus escaped to the grove of the Furies, where he was slain at his

own request by a slave, who then killed himself.

Grace (grās), in theology, the divine influence or the influence of the Holy Spirit in renewing the heart and restraining from sin; or, that supernatural gift to man whereby he is enabled to take to himself the salvation provided and offered through Christ (special or saving grace). Before the fifth century little attention was paid to the dogmatic question of grace and its effects. Pelagius, a native of Britain, having used some free expressions, which seemed to attribute too little to the assistance of divine grace in the renovation of the heart of man, and too much to his own ability to do good, Augustine undertook an accurate investigation of this doctrine. He came to the opinion, which has since been so much discussed, that God, of his own free-will, has foreordained some to eternal felicity and others to irrevocable and eternal misery. In accordance with this view of Augustine is the doctrine of predestination. The majority of those who were considered Catholic or Orthodox coincided with Augustine, and, with him, pronounced the Pelagians heretics, for holding that human nature is still as pure as it was at its first creation, that all the corruption which prevails is the effect of the influence of bad example, and that, consequently, man being sufficient for his own purification, has no need, at least, of preventing grace. The Abbot Cassianus, of Marseilles, adopted a middle course, in order to reconcile the operations of grace and free-will in man's renovation, by a milder and more scriptural mode. He considered the predestination of God, in respect to man's salvation, as a conditional one, resting upon his own conduct. His followers were named *semi-* or *half-Pelagians*, though the Catholic Church did not immediately declare them heretics. Subsequently a gradual change of sides was exhibited. During the middle ages the scholastic theologians so perverted the doctrines of Augustine as to make them easily reconcilable with those of the Pelagians. But at the Reformation Calvin and Beza, and the great body of their followers, returned to the fundamental principles of Augustine. In the meantime, however, the Catholics had not come to a final agreement concerning this dogma. This appears from the quarrels of the Dominicans and Jesuits, and from the case of the Jesuit Lewis Molina, in 1588, from whom the Molinistic disputes in the Netherlands received their name. In the seventeenth century, also, two new parties, which had their origin in the dispute concerning the doctrine of predestination, sprang up in the Netherlands, namely the Arminians or Remonstrants, among the Protestants, and the Jansenists among the Catholics. (See *Arminians*, *Jansenists*.) From that time the members of the Christian church have continued to differ upon this subject.

Grace, Days of, in commerce, a certain number of days immediately following the day, specified on the face of a bill or note, on which it becomes due. Till the expiry of these days payment is not necessary. In Britain and the United States the days of grace are three, but they have been rescinded in some of the American States. Austria (three days) and Russia (ten days) are the only other countries which allow days of grace.

Graces (grā'ses; Greek, *Charites*, translated by the Romans *Gratiæ*), the goddesses of grace, from whom, according to Pindar, comes everything beautiful and agreeable. According to most poets and mythologists, they were three in number, the daughters of Zeus and Eurynŏme, and Hesiod gives them the names of *Aglaia* (brilliancy), *Thalia* (the blooming), and *Euphrosÿnē* (mirth). Homer mentions them in the *Iliad* as handmaids of Hera (Juno), but in the *Odyssey* as those of Aphroditē (Venus), who is attended by them in the bath, etc. He conceived them as forming a numerous troop of goddesses, whose office it was to render happy the days of the immortals. The three graces are usually represented slightly draped or entirely nude, locked in each other's embrace, or hand in hand.

Graciosa (grā-sē-ō'za), one of the Azores. Chief town, Santa Cruz. Pop. 9000.

Gradient (grād'yent), in roads and railways, a term used to signify the departure of the track from a perfect level, usually expressed as a fraction of the length: thus 1 in 250 signifies a rise or fall of 1 foot in 250 feet measured along the line.

Gradual (grad'ū-al), the psalm, anthem, or hymn, said or sung in the service of the Roman Catholic Church between the Epistle and the Gospel; so named from being anciently chanted on the steps of the ambo or pulpit, or of the altar. By an easy transition the name was frequently applied to the Antiphonary, which was originally one of the three service books of the church, but afterwards in the eleventh or twelfth century included in the missal.

Graduation (grad-ū-ā'shun), the art of dividing into the

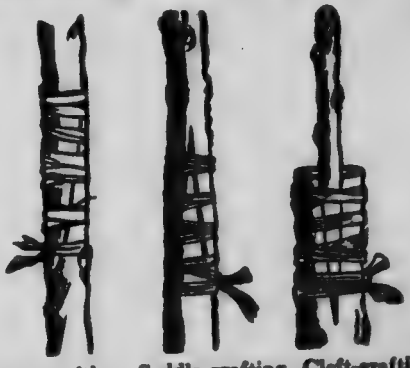
necessary spaces the scales of mathematical, astronomical, and other philosophical instruments. Common graduation is simply effected by copying from a scale prepared by a higher process; original graduation is chiefly performed either by *stepping* or bisection. Stepping consists in ascertaining by repeated trial with finely-pointed spring-dividers—which are made, as it were, to proceed by successive steps—the size of the divisions required, their number being known, and then finally marking them. In bisection the beam compasses are used, an arc with a radius of nearly half the line being described from either end of the line, and the short distance between the arcs bisected with the aid of a magnifier and a fine pointer. The process is repeated, for each of the two halves thus obtained, until by subdivision the required graduation is obtained. Ordinary instruments are graduated by machines, most of which are based upon the principle of that invented by Ramsden in 1766. In this there is a horizontal wheel, turning on a vertical axis, with a toothed edge which is advanced a certain amount (*e. g.* 10′ of arc) by each revolution of the endless screw with which it gears. The screw is worked by a treadle, and the machine can be so adjusted that a movement of the treadle shall secure either the whole or any desired part of a revolution of the screw. A dividing engine was invented by Troughton, but it was exceedingly complicated. That of Simms, which was self-acting and threw itself out of gear when its work was done, takes a high place among mechanical inventions. The most accurate was that of Andrew Ross (1831). For fine graduation Froment invented a machine in which the object to be graduated was slowly and intermittingly pushed forward by a screw, while a fine steel or diamond point, working automatically, made a cut at each cessation of the feeding motion. He thus drew 25,000 lines marking equal intervals in the space of one inch, but the number has since been increased to 225,000 by Nobert See *Nobert's Test Plates.*

Gra'dy, HENRY WOODFEN, editor, born at Athens, Georgia, in 1851. After being correspondent to the Atlanta *Constitution* and Southern correspondent to the New York *Herald*, he became editor and part-owner of the *Constitution*. He was devoted to the development of the 'New South,' and was widely known as the exponent of friendly feelings toward the North. His numerous articles on the condition of the South attracted universal attention. He died in 1889.

Graffiti (graf-fē'tē), the rude designs and inscriptions of popular origin drawn or engraved with a style upon the walls of ancient towns and buildings, particularly of Rome and Pompeii. Those in Pompeii are in Latin, Greek, and Oscan.

Graft, GRAFTER, a recent addition to political slang in the United States, and referring to the practice of secret bribery for political services or of defrauding states or cities for personal aggrandizement. Any dishonest gain in political or official service is called graft, and those taking part in it grafters. A grafter has been defined by Governor Folk, of Missouri, as 'one who fastens himself on the people either with or without the sanction of the law, and draws an unjust profit from the people.' (For analogy see next article.)

Grafting (graft'ing), an operation by which a bud or scion of an individual plant is inserted upon another individual, so as to become organically united with the stock on which it has been placed. Grafting can only take place between plants which have a certain affinity, individuals of the same species, genus, or order. The graft does not become identified with the stock to which it is united, but retains its own peculiarities of variety or species. The



Splice-grafting. Saddle-grafting. Cleft-grafting.

parts between which grafting is effected must be actively vegetating. The advantages derived from grafting are the preservation of remarkable varieties, which could not be reproduced from seed; the more rapid multiplication of particular species, and the anticipation of the period of fructification, which may thus be advanced by several years. The principal methods of grafting are—1. *By approach.*—This process is intended to unite at one or more points two plants growing from separate roots. Plates of

bark of equal size are removed, the wounds are kept together and protected from air. Stems, branches, or roots may be united in this way. 2. *By scions.*—Under this head there are a variety of methods, such as *whip*, *splice*, *cleft*, *saddle*, *crown grafting*, etc. In *whip-grafting* or *tongue-grafting* the stock is cut obliquely across and a slit or very narrow angular incision is made in its center downwards across the cut surface, a similar deep incision is made in the scion upwards, at a corresponding angle, and, a projecting tongue left, which being inserted in the incision in the stock, they are fastened closely together. *Splice-grafting* is performed by cutting the ends of the scion and stock completely across in an oblique direction, in such a way that the sections are of the same shape, then laying the oblique surfaces together so that the one exactly fits the other, and securing them by tying or otherwise. In *cleft-grafting*, the stock is cleft down, and the graft, cut in the shape of a wedge at its lower end, is inserted into the cleft; while, in *saddle-grafting*, the end of the stock is cut into the form of a wedge, and the base of the scion, slit up or cleft for the purpose, is affixed. *Crown-grafting* or *rind-grafting* is performed by cutting the lower end of the scion in a sloping direction, while the head of the stock is cut over horizontally and a slit is made through the inner bark. A piece of wood, bone, ivory, or other such substance, resembling the thinned end of the scion, is inserted in the top of the slit between the alburnum and inner bark and pushed down in order to raise the bark, so that the thin end of the scion may be introduced without being bruised. The edges of the bark on each side are then brought close to the scion, and the whole is bound with matting and a lump of clay put round it. 3. *By buds.*—This consists in transferring to another stock a plate of bark, to which one or more buds adhere. Bud-grafting is the most commonly practised, especially for multiplying fruit-trees and roses, owing to the facility with which it may be performed.

Grafton (graf'ton), AUGUSTUS HENRY, THIRD DUKE OF, born in 1735. He was secretary of state under Rockingham, first lord of treasury under the elder Pitt, and premier during the illness of the latter (then Lord Chatham). He subsequently held the privy seal under Lord North, and again under Rockingham. He died in 1811. He was the subject of some of the most brilliant of the famous and bitingly satirical letters of Junius.

Grafton (graf'ton), county seat of Taylor County, West Virginia, 99 miles S. E. of Wheeling, in a region of coal and natural gas. It has railroad shops, glass, tile and pottery works, etc.; a state reform school and national cemetery. Pop. 3500.

Grafton, a village of Worcester County, Massachusetts, 9 miles S. E. of Worcester. The township is drained by the Blackstone River and its tributaries, which afford water-power. Boots and shoes, cotton and thread are largely manufactured. Pop. 5705.

Gragnano (grä-nyä'nō), a town of Italy, province of Naples. It is chiefly of interest for its wines and macaroni. Pop. 13,955.

Graham (grām or grā'am), GEORGE, mechanician and watchmaker, born in Cumberland, 1675. He succeeded Topion, the watchmaker, in business in London, and invented several important astronomical instruments. He invented the dead-beat escapement and a compensation pendulum for clocks.

Graham, JAMES. See *Montrose, Marquis of.*

Graham, JOHN, Viscount Dundee, commonly known as Claverhouse, eldest son of Sir William Graham of Claverhouse, was born about 1650 and educated at St. Andrews. He went abroad and entered the service of France and afterwards of Holland, but, failing to obtain the command of a Scottish regiment in the Scottish service, he returned to Scotland in 1677, where he was appointed captain of a troop of horse raised to enforce compliance with the establishment of Episcopacy. He distinguished himself by an unscrupulous zeal in this service, especially after the murder of Archbishop Sharpe in May, 1679. The Covenanters were driven to resistance, and a body of them defeated Claverhouse at Drumclog, on 1st June. On the 22d, however, the Duke of Monmouth defeated the insurgents at Bothwell Brig, and Claverhouse was sent into the west with absolute power. In 1682 he was appointed sheriff of Wigtonshire, and, assisted by his brother David, continued his persecutions. He was made a privy-councilor, and received the estate of Dudhope, with other honors from the king, and although on the accession of James his name was withdrawn from the privy-council it was soon restored. In 1686 he was made brigadier-general, and afterwards major-general; and in 1688, after William had landed, he received from James in London the titles of Lord Graham of Claverhouse and Viscount Dundee. When the king fled he returned to Edinburgh, but

finding the Covenanters in possession he retired to the north, followed by General Mackay. After making an attempt on Dundee, Claverhouse finally encountered and defeated Mackay in the Pass of Killicrankie (17th July, 1689), but was killed in the battle.

Graham, Thomas, master of the mint, an eminent chemist, was born at Glasgow in 1805, and educated at Glasgow University. In 1827 he commenced teaching private mathematical classes in Glasgow, and in 1829 succeeded to the lectureship of chemistry in the Andersonian University. In 1831 he was appointed professor of chemistry in the Amsterdam University. In 1831 he established the law that gases tend to diffuse inversely as the square root of their specific gravities. He afterwards made a series of investigations into the constitution of arsenates, phosphates, and phosphoreted hydrogen, and into the function of water in different salts. In 1837 he was elected professor of chemistry in the University of London, and soon after settling in the metropolis he was appointed assayer to the mint. In 1841 he was chosen first president of the Chemical Society, which he had assisted in founding; and in 1846 he assisted in founding the Cavendish Society, over which he presided. He read the Bakerian lecture in 1849 and in 1854, the subject of both being the diffusion of liquids, which he further treated before the Royal Society in 1861. He distinguished the crystalloids and colloids in liquid solutions, and gave to their separation the name of *dialysis*. In a subsequent paper, *Philosophical Transactions*, 1866, he applied these discoveries to gases, under the name of *atmolysis*. The passage of gases through heated metal plates and the occlusion of gases were also ably investigated by him. He died in 1869.

Grahame (grām or grā'am), James, a Scottish poet, born in Glasgow in 1765. He studied law in Edinburgh, and in 1791 became a Writer to the Signet. In 1795 he was admitted to the Faculty of Advocates, of which he continued a member until 1809, when he took orders as a clergyman of the Church of England. Previous to this all his literary productions had been published. While at the university he printed and circulated a collection of poetical pieces. These appeared in an amended form in 1797. In 1801 he published a dramatic poem entitled *Mary, Queen of Scotland*, and in 1802 appeared, anonymously, *The Sabbath*. The *Birds of Scotland*, and *British Georgics* followed. He subsequently held curacies at Shefton, Durham, and Sedgefield, but his health gave way, and he died at Glasgow in 1811.

Graham Island, or Ferdinandea, a volcanic island which in July, 1831, rose up in the Mediterranean, about 30 miles southwest of Sciacca, in Sicily. It attained a height of 200 feet, with a circuit of 3 miles, but disappeared in August. It reappeared for a short time in 1863.

Graham Land, a tract of land in the Antarctic Ocean; discovered in 1832 by Biscoe, who took possession of it for Great Britain. It stretches between lat. 63° and 68° s., and lon. 61° and 68° w.; and is supposed to be of great extent.

Grahamstown, a town of Cape Colony, district of Albany, about 480 miles east of Cape Town. It is a well-built, thriving place, and is the seat of an Anglican bishop. Pop. about 15,000.

Grail (grāl; variously spelt *Greal, graal, Grazal, Grasal*, etc.), the legendary holy vessel, supposed to have been of emerald, from which Christ dispensed the wine at the last supper. It was said to have been brought to England by Joseph of Arimathea, but to have been taken back to heaven until the appearance of heroes worthy to be its guardians. Titurel, a descendant of the Asiatic prince Perillus, whose descendants had allied themselves with the family of a Breton sovereign, was chosen as its keeper. He erected for it a temple on the model of that at Jerusalem, and organized a band of guardians. It was visible only to the baptized and pure of heart. With this legend that of King Arthur became connected. Three of his knights, Galahad, Percival, and Bors, had sight of it, and on the death of Percival it was again taken to heaven.

Grain (grān), the name of a small weight, the twentieth part of a scruple in apothecaries' weight, and the twenty-fourth of a pennyweight troy. See *Avoirdupois*.

Grain includes all those kinds of grass which are cultivated on account of their seeds for the production of meal or flour. All kinds of grain contain in varying quantities the following elements: gluten, fecula or starch, a sweet mucilage, a digestible aromatic substance contained in the hulls, and moisture, which is predominant even in the driest grain, and serves, after planting, to stimulate the first motions of the germ. The grains include wheat, oats, rice, Indian corn, rye, buckwheat, barley, millet, etc. The term, corn, used in Europe, is restricted to Indian corn in United States

Grain Coast, the former name of Liberia, on the west coast of Africa. See *Grains of Paradise.*

Grain Elevator. See *Elevator.*

Graining (*Leuciscus Lancastriensis*), a fish of the dace kind, found chiefly in the Mersey and its tributaries, and in some of the Swiss lakes. The nose is more rounded than that of the dace, the eye larger, and the dorsal fin commences half-way between the point of the nose and the end of the fleshy portion of the tail. It seldom weighs more than half a pound; in habit and food it resembles the trout.

Grain-leather, dressed horse-hides, goatskins, sealskins, etc., blacked on the grain side, that is the hair side, for shoes, boots, etc.

Grain-moth, a minute moth of which two species are known, *Tinea granella* and *Butalis cerealella*, whose larvæ or grubs devour grain in granaries. The moths have narrow, fringed wings, of a satiny luster.

Grains of Paradise, Guinea grains or Malaguetta pepper, the pungent somewhat aromatic seeds of *Amomum Melegueta*, nat. order Zingiberaceæ, a plant of tropical Western Africa. They are chiefly used in cattle medicines and to give a fiery pungency to cordials. The 'Grain Coast' of Africa takes its name from the production of these seeds in that region.

Grakle (grak'l; *Gracula*), a genus of birds of the order Passeres, and of the starling family (Sturnidæ), inhabiting India and New Guinea. One of the genus is the Indian mina bird (*G. musica*), which can be taught amusing tricks and can imitate the human voice. It is of a deep velvet black, with a white spot on the wing, yellow bill and feet, and two yellow wattles on the back of the head. A considerable number of other birds not belonging to this genus have also been called grakles, such as the purple grakle, or crow-blackbird of America. See *Crow-blackbird.*

Grallatores.—Head and Foot of Crane.

Grallatores (gral-a-tō'-rēs), an order of birds which formerly included the heron, ibis, stork; but these are now put into another order, and the Grallatores, properly so called, consist of the following families, namely, those of the snipe, stint, and ruff; the red-shanks, green-shanks, and sand-pipers; the curlews, phalaropes, stilts, and avocets; the plovers, oyster-catchers, turnstones, lapwings, coursers;

Grallatores.—a, Leg and foot of curlew. b, Head of snipe. c, Beak of avocet.

the jacanas, and bustards; the rails and coots; and the cranes. They are generally known as wading birds, as they frequent shores and banks of streams, marshes, etc., and their legs and beak are commonly rather long.

Gram, the chickpea (*Cicer arietinum*), used extensively in India as fodder for horses and cattle, and now being introduced into our Southern States.

Gramineæ (gram'i-ne-ē). See *Grass.*

Grammar (gram'ar), in reference to any language, is the system of rules, principles, and facts which must be known in order to speak and write the language correctly. *Comparative grammar* treats of the laws, customs, and forms which are shown by comparison to be common to various languages; *general* or *universal grammar*, of those laws which, by logical deduction, are demonstrated to be common to all. The divisions of grammar vary with the class and also with the method of treatment. In common English grammars the division is generally fourfold: *orthography*, which treats of the proper spelling of words, and includes orthoepy, treating of the proper pronunciation; *etymology*, which treats of their derivations and inflections; *syntax*, of the laws and forms of construction common to compositions in prose and verse; *prosody*, of the laws peculiar to verse. Although the systematization of grammar had begun in some sort in Plato's time it was chiefly to the Alexandrian writers that it owed its development. The first Greek grammar for Roman students was that of

Dionysius Thrax, in use about 80 B.C. Comparative grammar can only be said to have existed from the beginning of the nineteenth century, when the critical study of Sanskrit established the affinities of the languages of the Indo-European group.

Grammar Schools, an old name of a class of schools at which a secondary education is given, as a preparation for a university course. The term seems to have arisen from the once almost exclusive occupation of these schools in the teaching of the elements or grammar of the Latin and Greek languages. In England the character of the teaching in secondary schools, where not restricted by endowments, is necessarily influenced by the course of instruction in the universities, in which the classical element still preponderates. In Scotland, however, the grammar schools appear rather to have led the movement to adapt the higher education to the practical requirements of modern life, as also in the United States, where the term High School or College is generally used. Many of these present diplomas to graduates.

Gramme (gram), the unit of weight in France = 15.4323 grains. A decagramme or ten grammes = 5.644 drams; a hectogramme (100 grammes) = 3.527 oz.; a kilogramme (1000 grammes) = 2.205 lbs.; a myriagramme (10,000 grammes) = 22.046 lbs.

Grammont (grâ-mon), a town of Belgium, East Flanders, 22 miles S. S. E. of Ghent, on both sides of the Dender. Chief manufactures: linen, lace, thread, paper, tobacco-pipes, etc. Pop. 11,997.

Grammont, Order of (*Grandmontains*), a monastic order established by Stephen of Thiers in 1076 at Muret, but afterwards (1124) removed to Grandmont. The order became extinct at the Revolution.

Gramont, or Grammont, Philibert, Count de, son of Anthony, duke of Grammont, born in 1621. He served under the Prince of Condé and Turenne, went to England two years after the Restoration, and was highly distinguished by Charles II. After a long course of gallantry he married, under compulsion, Miss Elizabeth Hamilton, and died in 1707. His memoirs we. dictated to his brother-in-law, Anthony, Count Hamilton, who followed James II. entered the French service, and died in 1720.

Gramophone (gram'ō-fōn), an instrument for recording speech, similar in character to the phonograph. Instead of a wax cylinder, it employs a circular plate of metal covered with a film of oily matter on which the record is traced in a spiral line. This record is etched into the metal, or photographically reproduced on another sheet of metal. The sound is reproduced by causing the point attached to the diaphragm to follow the spiral record as the plate is rotated.

Grampian Mountains (gram'-pi-an), a range, or rather series of ranges and elevated masses, stretching across Scotland diagonally S. W. to N. E. for about 150 miles. With the exception of Ben Nevis, the Grampians comprise all the highest mountains in Scotland, Ben Cruachan, Ben Lomond, Ben Lawers, Schiehallion, Ben Macdhui (4296 feet), Cairngorm, Cairntoul, etc.

Grampus (gram'pus), a name for several marine cetaceous mammals allied to the dolphins, especially *Orca gladiator* of the Atlantic and North Sea, which grows to the length of 25 feet, and is remarkably thick in proportion to its length. The spout-hole is on the top of the neck. The color of the back is black; the belly is of a snowy whiteness, and on each shoulder is a large white spot. The grampus is carnivorous and remarkably voracious, even attacking the whale.

Gran (grän), a town of Hungary, at the confluence of the Gran with the Danube, 25 miles northwest of Budapest. It was the residence of the Hungarian monarchs, and their finest city till ruined by the Turks about 1613. It is an archbishop's see and has a fine cathedral. Pop. 17,909.

Granada (grä-nä'dä), a city in the south of Spain, capital of the province of Granada. The streets rise picturesquely above each other, with a number of turrets and gilded cupolas, the whole being crowned by the Alhambra (which see), or palace of the ancient Moorish kings. In the background lies the Sierra de Nevada, covered with snow. The streets, however, are narrow and irregular, and the buildings inferior to those of many other towns in Spain. The town is partly built on two adjacent hills, between which the Darro flows, traversing the town and falling into the Genil, which flows outside the walls. The cathedral is an irregular but splendid building, and the archbishop's palace and mansion of the captain-general are also noteworthy; but the special features of the town are the Alhambra, and another Moorish palace called the *Generalife*, built on an opposite hill. Granada has

no manufactures of importance. Its university was founded about 1530, and is attended by some 1000 students. The city was founded by the Moors before 800, and from 1036 to 1234 was included in the Kingdom of Cordova. In 1235 it became the capital of the Moorish kingdom of Granada, and attained almost matchless splendor. In 1491 it remained the last stronghold of the Moors in Spain, but was taken by the Spaniards under Ferdinand and Isabella in 1492, along with the kingdom, having then a population of perhaps 500,000. Its prosperity continued almost without diminution till 1610, when the decree expelling the Moors from all parts of Spain told severely upon it, and it has never recovered. Pop. 75,900.—The province, which is partly bounded by the Mediterranean, has an area of 4928 sq. miles. Pop. 492,460.

Granada, formerly a Moorish kingdom in Spain, bordering on the Mediterranean, now represented by the three provinces, Granada, Almeria, and Malaga; area, 11,000 sq. miles. The interior is mountainous, being traversed from east to west by several ranges, particularly the Sierra Nevada; but many of its valleys and low grounds are distinguished by beauty and fertility. The olive and vine are extensively cultivated, and fruit is very abundant. The sugar-cane thrives in some parts. After long forming part of the kingdom of Cordova, Granada became a separate kingdom in 1235. In 1492 it passed into the possession of the Spaniards.

Granadilla (gran-a-dil'a), the West Indian name for the fruits of various species of *Passiflora*, a genus of the passion-flower family. Some species have been introduced into Europe, chiefly for their flowers, the chief being the purple-fruited, *P. edulis;* the water-lemon, *P. laurifolia;* the flesh-colored granadilla, and the *P. quadrangularis*, the most valuable for cultivation in Great Britain.

Granby (gran'bi), JOHN MANNERS, MARQUIS OF, son of the Duke of Rutland, born in 1721; educated at Eton and Cambridge; raised a foot regiment in 1745; became colonel of horse-guards in 1758 and lieutenant-general in 1759; commanded the British troops in the Seven Years' war (1760-63), and was commander-in-chief of the British army from 1766 to 1770, the year of his death. He was elected to Parliament in 1754, 1761, and 1768.

Gran Chaco, EL (el grän chä'kō), a territory of the Argentine Republic, lying mainly between the Vermejo, Paraná, and Salado. In the west it is intersected by offsets of the Andes, and in the east forms extensive plains and marshes, while in the south are sandy deserts interspersed with salt pools. Greater part, however, is covered with primeval forest. It is inhabited by various Indian tribes, the total Indian population being estimated at from 20,000 to 40,000. The Central Chaco is well adapted for growing sugar-cane, tobacco, maize, rice, etc., but not for cereals generally. The name is also applied to a much more extensive territory of similar character extending into Bolivia and Paraguay.

Grand Army of the Republic, an organization of the Union soldiers who served in the Civil war, formed in 1866 at Decatur, Illinois. It spread to other States very rapidly, a convention held in November of that year being attended by delegates from 10 States. The second 'Encampment' was held in Independence Hall, Philadelphia, in 1868, Gen. John A. Logan, of Illinois, being elected commander-in-chief. Since that date annual conventions have been held, and since 1878 the commander has been changed annually. In 1910 an enthusiastic and well attended convention was held at Atlantic City, New Jersey, but the ranks of the veteran order had been rapidly depleted by death, and in the years to come the decrease will be very rapid. Largely through the efforts of the order service pensions have been granted to all soldiers of the war, and the veteran band is now cared for by the government. Affiliated organizations are the 'Woman's Relief Corps,' the 'Loyal Ladies' League,' and 'The Sons of Veterans.' On the 50th anniversary of the battle of Gettysburg, in July, 1913, a great reunion of the Grand Army, with Confederate veterans, was held at Gettysburg, the ceremonies including scenes representing incidents of the battle, etc.

Grand Canon of the Colorado, a deep gorge through which the Colorado River flows in Arizona, 217 miles in length and surpassing in depth and grandeur any other cañon on the earth. With the addition of Marble Cañon, with which it connects, it is 286 miles long. The summit width varies from 9 to 13 miles, and the average depth is over 5200 feet, the maximum depth being 6300 feet, a depth maintained for about 50 miles. It is believed to have been entirely excavated by the river, which is supposed to have begun its course in the surface of the plateau. Boating parties have several times gone down the chasm, though

rapids and falls render this enterprise very dangerous, and a number of lives have been lost in the attempt.

Grand Duke, the title of the sovereign of several of the states of Germany, who are considered to be of a rank between duke and king; also applied to members of the imperial family of Russia.

Grandee (gran-dē'), in Spain a noble of the first rank, consisting partly of the relatives of the royal house, and partly of such members of the high feudal nobility as had the right to enlist soldiers under their own colors. Besides the general prerogatives of the higher nobility, and the priority of claim to the highest offices of state, the grandees possessed the right of covering the head in the presence of the king, with his permission. The king called each of them 'my cousin' (*mi primo*), while he addressed the other members of the high nobility only as 'my kinsman' (*mi pariente*).

Grand Falls, a garden city, founded 1905, on Exploits R., Newfoundland, Canada, about 60 miles below Red Indian Lake. Neighboring spruce forests supply material, and the Grand Falls, power, developed to 23,500 horsepower, for great paper-mills. The proprietors secured 2300 square miles of woodland, where a cut of 50,000,000 feet is made annually. The city sprang into existence completely equipped with churches, schools, halls, hotels, etc. The daily output of the mills, comprising eleven large steel buildings, is 120 tons of "newsprint" paper per day.

Grand Forks, a city of North Dakota, county seat of Frand Forks County, on the Red River of the North, and on the Northern Pacific and Great Northern railroads. It is the seat of the University of North Dakota and Wesley College and is an important distributing and manufacturing center. Flour, lumber and flax products lead. Pop. 12,478.

Grand Haven, a city and summer resort, capital of Ottawa County, Michigan, on Lake Michigan, and on the s. bank of Grand River. It is 80 miles by water E. of Milwaukee, and is a port of entry with a good harbor, 20 to 30 feet deep. There are large shipments of grain, fruits, and celery, important fisheries, shipyards, and various manufactures. Pop. 5856.

Grand Island, a city of Nebraska, capital of Hall County, on the Platte River, 154 miles W. by S. of Omaha. It has sugar and brewing industries, brick and marble-works, a large horse market. It is on the Lincoln Highway of the Coast-to-coast Auto Route. Pop. 12,000.

Grand Junction, a city, capital of Mesa County, Colorado, 93 miles S. W. of Glenwood Springs. Gold, silver, and coal are found in its vicinity, and it has a beet-sugar factory, fruit evaporators, etc. Pop. 7754.

Grand Jury, a body of men selected according to the different laws of the several states, usually numbering 24, and whose duty it is to receive secretly the evidence presented regarding alleged crimes, and if satisfied that a crime has probably been committed, then to present an indictment against the accused to the proper court. As a rule, the Grand Jury is approachable only through the prosecuting officer of the district, but they have a right to take up any inquiry independently of such officer, and it is also within their power, if not their duty, to investigate in a general way the conditions of public institutions, and make presentments regarding the same.

Grand Pensionary, formerly an officer of the Dutch Republic. In the great towns the first magistrate was called a pensionary, his office being a paid one. The grand pensionary was the secretary of state of the Province of Holland. He held office for five years, and was eligible for re-election. The office was abolished on the formation of the Kingdom of Holland in 1806.

Grand Pre (grän prē), a beautiful village on the basin of Minas, King's County, Nova Scotia; the scene of Longfellow's poem, *Evangeline*. The French settlers there were expelled by Virginian colonists in 1613. Pop. 1600.

Grand Prix (grän prē). See *Ecole des Beaux Arts*.

Grand Rapids, a city, capital of Kent County, Michigan, situated on the rapids of the Grand River, 30 miles from its mouth. Its manufacturing interests are greatly promoted by the fine water-power. It is traversed by several railroads and has a large trade in lumber, and extensive manufactures, the furniture works alone employing more than 16,000 hands. Nearby are large gypsum quarries and cement and calcined plaster are extensively manufactured. The city has many fine public and private edifices, various charitable institutions, and is the seat of Catholic and Protestant Episcopal bishoprics. Pop. 135,000.

Grand Rapids, a city, capital of Wood County, Wisconsin, 22 miles S. W. of Stevens' Point. It has paper and pulp mills, flour mills, and other industries. Pop. 6521.

Grand Sergeanty, an ancient tenure of land similar to knight-service, but of superior dignity. Instead of serving the king generally in his wars, the holder by this tenure was bound to do him some specified honorary service, to carry his sword or banner, to be the marshal of his host, his high-steward, butler, champion, or other officer. It was practically abolished with other military tenures by Charles II.

Grange (grānj), in the United States, a society of farmers organised for the purpose of promoting the interests of agriculture, more especially for abolishing the restraints and burdens imposed on it by the commercial classes, the railroad and canal companies, etc., and for doing away with middlemen. Granges originated in the order of Patrons of Husbandry, founded in Washington in 1867. The central body of this was called the National Grange, and subordinate granges were established in the several states until they numbered more than 27,000 in all. Women were admitted to membership on equal terms with men, and this aided greatly in the rapid growth of the order, which in 1875 had a membership of 1,500,000. It was political in its early purposes, and succeeded in having several laws passed in the interest of agriculture. It also sought to gain control of grain elevators and railroad terminal facilities. The political movement was afterwards left to the Farmers' Alliance (which see), leaving the grange to a useful growth in the social and industrial field. Its membership has much decreased, yet it remains a popular institution.

Grangemouth (grānj'muth), a seaport and police burgh, Stirlingshire, Scotland, at the entrance of the Forth and Clyde Canal, 3 miles E. N. E. of Falkirk. The town was founded in 1777 in connection with the construction of the canal; its prosperity was increased by the opening of docks in 1843, 1859, and 1882. It has shipbuilding-yards, sawmills, a rope and sail factory, and brickworks. Pop. 17,-803.

Granier de Cassagnac. See *Cassagnac.*

Granilite (gran'i-līt), an indeterminate granite; variety of granite that contains more than three constituent parts.

Granilla (gran-il'a), the dust or small grains of the cochineal insect.

Granite (gran'it), an unstratified rock, composed generally of the minerals quartz, felspar, and mica, mixed up without regular arrangement of the crystals. The grains vary in size from that of a pin's head to a mass of two or three feet, but they seldom exceed the size of a large gaming die. When they are of this size, or larger, the granite is said to be 'coarse-grained.' Granite is an igneous, or fire-formed, rock which has been exposed to great heat and pressure deep down in the earth. It is one of the most abundant of the igneous rocks seen at or near the surface of the earth, and was formerly considered as the foundation rock of the globe, or that upon which all sedimentary rocks repose; but it is now known to belong to various ages from the Pre-Cambrian to the Tertiary, the Alps of Europe containing granite of the later age. In Alpine situations it presents the appearance of having broken through the more superficial strata; the beds of other rocks in the vicinity rising towards it at increasing angles of elevation as they approach it. It forms some of the most lofty of the mountain chains of the eastern continent, and the central parts of the principal mountain ranges of Scandinavia, the Alps, the Pyrenees, and the Carpathian Mountains are of this rock. It is abundant in America and is largely quarried in the United States for building purposes, especially in New England, the best known quarries being those of New England. It is abundant in South Carolina and Georgia, but much of this, as well as that of some parts of California, is in a singular state of decomposition, in many places being easily penetrated by a pick. Granite supplies the most durable materials for building, as many of the ancient Egyptian monuments testify. It varies much in hardness as well as in color, in accordance with the nature and proportion of its constituent parts, so that there is much room for care and taste in its selection. Granite in which felspar predominates is not well adapted for buildings, as it cracks and crumbles down in a few years. The decomposed felspar of some varieties of granite yields the kaolin used in porcelain manufacture. Granite in which mica is replaced by hornblende is called *syenite*, the famous Quincy granite of Massachusetts being properly a syenite. When both mica and hornblende are present it is called *syenitic granite*; when talc supplants mica it is called *protogene*,

talcose, or *chloritic granite;* a mixture of quartz and hypersthene, with scattered flakes of mica, is called *hypersthenic granite;* and the name of *graphic granite*, or *pegmatite*, is given to a variety composed of felspar and quartz, with a little white mica, so arranged as to produce an irregular laminar structure. When a section of this latter mineral is made at right angles to the alternations of the constituent materials, broken lines resembling Hebrew characters present themselves; hence the name. Granite abounds in crystallised earthy minerals; and these occur for the most part in veins traversing the mass of the rock. Of these minerals beryl, garnet, and tourmaline are the most abundant. It is not rich in metallic ores. The *oriental basalt*, found in rolled masses in the deserts of Egypt, and of which the Egyptians made their statues, is a true granite, its black color being caused by the presence of hornblende and the black shade of the mica. The *oriental red granite* chiefly found in Egypt, and of which Pompey's Pillar and Cleopatra's Needles were constructed, is composed of large grains or imperfectly formed crystals of flesh-colored felspar, of transparent quartz, and of black hornblende.

Granite City, a city in Madison County, Illinois, opposite St. Louis. It has steel foundries, lead and enameling works, box factory, brewery, machine shops, etc. Pop. 15,000.

Granja (grän'hä), La. See *Ildefonso.*

Grano (grä'nō), a coin of Malta, about 1/6 cent in value.

Gran Sasso D'Italia, or Monte Corno, a mountain of Naples, the culminating peak of the Apennines; height, 9519 feet.

Grant, in law, a gift in writing of such a thing as cannot be passed or conveyed by word only; thus, a grant is the regular method by the common law of transferring the property of incorporeal hereditaments, or such things whereof no actual delivery of possession can be had.

Grant, Frederick Dent, soldier, son of Gen. U. S. Grant, was born at St. Louis, Missouri, in 1850. He graduated at West Point in 1871, became colonel of the Fourth Cavalry, and resigned in 1881. He was appointed minister to Austria in 1885, and was police commissioner of New York, 1894-96. He was made brigadier-general of volunteers on the outbreak of the Spanish war. Served in Porto Rico, and afterward commanded the military district of San Juan; transferred to Luzon, 1901-02. He was commissioned brigadier-general in the United States army in 1901, and major-general in 1906, and has commanded the Department of the Lakes since 1908. He died April 11, 1912.

Grant, George Munro, a Canadian author, born in Nova Scotia in 1835; died in 1902. He was made principal of Queen's University, Kingston, in 1877, and wrote *Ocean to Ocean*, and edited *Picturesque Canada.*

Grant, James, novelist, born at Edinburgh in 1822. In 1846 he published his first book, *The Romance of War.* A large number of works followed, most of them concerned with military life or based on historical events, *Adventures of an Aide-de-Camp* (1848), *Bothwell* (1851), *Jane Seton* (1853), *Frank Hilton* (1855), *King's Own Borderers* (1865), *White Cockade* (1867), *British Battles on Land and Sea* (1873), *Old and New Edinburgh* (1880-83), etc. He died in 1887.

Grant, Mrs. Anne, of Laggan, a distinguished Scottish authoress, born at Glasgow in 1755; maiden name, McVicar. Her husband, the Rev. James Grant of Laggan, died in 1801, and left her a widow, with eight children, in very embarrassed circumstances. In 1803 she published by subscription a volume of poems, and in 1806 won reputation by her *Letters from the Mountains*, a series of letters describing her life in the Highlands, the character of the people, and the natural scenery. Her chief subsequent works are her *Memoirs of an American Lady*, *Essays on the Superstitions of the Highlanders of Scotland* (1811), *Eighteen Hundred and Thirteen*, a poem (1814), and *Memoirs*, published in 1844. She died in 1838.

Grant, Ulysses Simpson, general and president of the United States, born in 1822, at Point Pleasant, Clermont County, Ohio. His real name was Hiram Ulysses Grant, the name afterwards used by him having arisen out of an error in the registration of his cadetship. After graduating in the military academy at West Point, he served during the Mexican war, taking part in every battle except Buena Vista, and being breveted captain for gallantry. In 1854 he resigned his commission and engaged first in farming near St. Louis, and then in the leather trade with his father at Galena, Illinois. On the outbreak of the war in 1861 he assisted in the organization of troops and when the 21st Illinois was formed he was made colonel. He seized Paducah, commanding the Tennessee and Ohio divisions; checked the departure of reinforcements

from Belmont, captured Fort Henry and Fort Donelson with their garrisons. Grant was thereupon promoted to the rank of major-general of volunteers and assigned to the district of West Tennessee. On April 6-7, 1862, he won the battle of Shiloh, the first great engagement of the war. He took part in the operations against Corinth and later assumed conduct of operations in that region. On October 16th, he was advanced to the command of the Department of the Tennessee. In November he commenced operations against Vicksburg, Mississippi. After a siege of forty-seven days (May 18 to July 4, 1863) the town surrendered with its large garrison. The important victory at Chattanooga, which followed, opened the way into Georgia for the Federal troops. In March, 1864, he was appointed lieutenant-general, and assumed command of all the armies of the United States. In a succession of

General Grant

hotly-contested battles at the Wilderness, Spottsylvania, North Anna, and Cold Harbor, he steadily advanced on Petersburg and Richmond, investing Petersburg and carrying on a protracted siege which continued for many months. The Confederate works were flanked at the end of March, 1865, and Lee's retreating army was pursued, surrounded, and forced to surrender, April 9, 1865. This event practically ending the war. In 1866 Grant was raised to the supreme rank of general, specially revived for his honor, and in 1868 was elected President of the United States. His administration allayed the soreness which still survived from the great struggle between the states, and was also noteworthy for the reduction of the national debt and the settlement of the Alabama dispute with England. He was re-elected in 1872. After his retirement in 1877 he made a journey around the world and was received everywhere with the highest honor, as one of the greatest of modern soldiers. Later he became involved in a financial concern which exploited his name and left him heavily in debt. He manfully endeavored to repair his fortune by writing and publishing his *Memoirs*, and in this he was successful, though suffering greatly from the cancerous disease of which he died at Mt. McGregor, New York, July 23, 1885. He was buried at Riverside, New York, August 8, 1885, in a handsome mausoleum built by the voluntary contributions of his admiring fellow-citizens.

Grantham (grant'am), a municipal and parliamentary borough of England, in Lincolnshire, 22½ miles S. S. W. of Lincoln. It is well built, principally of brick, and has a fine Gothic church of the thirteenth century, with a tower and spire 273 feet high Pop. (1911) 20,074.

Granulation (gran-ū-lā'shun), the subdivision of a metal into small pieces or films. It is employed in chemistry to increase the surface, so as to render the metal more susceptible to the action of reagents, and in metallurgy for the subdivision of a tough metal like copper. Small shot is made by a species of granulation.

Granulation, in surgery, the formation of little grain-like fleshy bodies on the surfaces of ulcers and formerly suppurating wounds, serving both for filling up the cavities and bringing nearer together and uniting their sides. The color of healthy granulations is a deep florid red. When livid they are unhealthy, and have only a languid circulation.

Granvella, or GRANVELLE (gran'vel), ANTOINE PERRENOT, CARDINAL DE, minister of state to Charles V and Philip II of Spain, was born in 1517 near Besançon. He studied at Padua and at Louvain, in his twenty-third year was appointed Bishop of Arras, and was present at the diets at Worms and Ratisbon. In 1545 he was sent to the Council of Trent, and on the death of his father in 1550 was appointed by Charles V to succeed him in the office of chancellor. In 1552 he negotiated the Treaty of Passau, and in 1553 arranged the marriage of Don Philip with Mary Queen of England. Under Philip II he remained chief minister, and in 1559 negotiated the Peace of Câteau-Cambrésis. Philip immediately after quitted the Netherlands, leaving Margaret of Parma as governor, and Granvella as her minister. In 1560 he became Archbishop of

Mechlin, and in 1561 was made a cardinal; but in 1564 he was obliged to yield to the growing discontent aroused by his tyranny in the Netherlands, resign his post, and retire to Besançon. In 1570 Philip sent him to Rome to conclude an alliance with the pope and the Venetians against the Turks, and afterwards to Naples as viceroy. In 1575 he was recalled to Spain, and placed at the head of the government with the title of President of the Supreme Council of Italy and Castile. In 1584 he was created Archbishop of Besançon, and died at Madrid in 1586. He preserved all letters and despatches addressed to him, nine volumes of which, published 1851-62, are of value in illustrating the history of the sixteenth century.

Granville (grän-vēl), a fortified seaport of France, department of Manche, at the mouth of the Bosco, in the English Channel. Pop. 11,629.

Granville (gran'vil), GRANVILLE GEORGE LEVESON-GOWER, 2D EARL, an English statesman, was born in London in 1815; educated at Eton and Christ Church, Oxford entered Parliament in 1836. In 1840 he became under-secretary for foreign affairs, and in 1846 succeeded to the peerage. In 1868 he was colonial secretary under Gladstone and in 1870 he became secretary for foreign affairs, which he held until 1874. During this period he negotiated the Treaty of 1870, guaranteeing the independence of Belgium, and 'protested' against the Russian repudiation of the Black Sea clause of the Treaty of Paris. He died in 1891.

Grape (grāp). See *Vine*.

Grapefruit, a tropical and semi-tropical fruit of the genus citrus, the size of the fruit varying from that of a large orange to 6 or 7 inch diameter. It grows from California to the West Indies and is extensively cultivated in Florida. The name comes from the fact that the fruits, despite their large size grow in clusters like grapes. The round variety, also known as Pomelo, is widely used as a dessert fruit. Another form, the Shaddock, is of pear shape and is seldom used as food.

Grape-shot.

Grape-shot, a kind of shot generally consisting of three tiers of cast-iron balls arranged, three in a tier, between four parallel iron discs connected together by a central wrought-iron pin. Case-shot is now more used than grape-shot.

Grape-sugar. See *Glucose*.

Graphite (graf'it), one of the forms under which carbon occurs in nature, also known under the names of *Plumbago*, *Black Lead*, and *Wad*. It occurs not infrequently as a mineral production, and is found in great purity at Borrowdale in Cumberland, and in large quantities in Canada, Ceylon, and Bohemia. Graphite may be heated to any extent in close vessels without change; it is exceedingly unchangeable in the air; it has an iron-gray color, metallic luster, and granular texture, and is soft and unctuous to the touch. It is used chiefly in the manufacture of pencils, crucibles, and portable furnaces, in burnishing iron to protect it from rust, for giving a smooth surface to casting molds, for coating wax or other impressions of objects designed to be electro typed, and for counteracting friction between the rubbing surfaces of wood or metal in machinery.

Graphophone (graf'o-fōn), an apparatus for reproducing sound, invented in 1880. Like the phonograph (which see), it has a main cylinder coated with wax, which revolves against the point of a needle. This connects with a diaphragm at the end of a tube running to the funnel mouthpiece. Words or other sounds passing into the mouthpiece cause the diaphragm to vibrate correspondingly and make a record by the needle on the wax cylinder. When the machinery is reversed the words are reproduced.

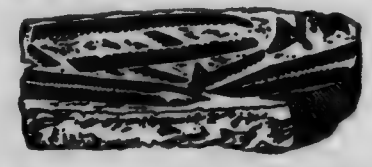
Graphotype (graf'o-tip), a process for obtaining blocks for surface printing, discovered in 1860 by De Witt Clinton Hitchcock, who observed that, on rubbing the enamel from a visiting-card with a brush and water, the printed letters stood out in relief, the ink having so hardened the enamel that it resisted the action of the brush. The first graphotype drawings were made on blocks of chalk with siliceous ink, but the chalk-block was soon superseded by the use of French chalk ground to the finest powder, laid on a smooth plate of zinc, submitted to intense hydraulic pressure, and then sized. The drawing is made with sable-hair brushes and ink composed of lamp-black and glue, and when finished is gently rubbed with silk velvet or fitch-hair brushes until the chalk between the ink lines is removed to the depth of ⅛ inch. The block is then hardened by being steeped in an alkaline silicate, and

molds being taken from it, stereotype plates are cast for printing.

Grapnel (grap'nel), or GRAPLING, a sort of small anchor, fitted with four or five flukes or claws, and commonly used to fasten boats or other small vessels. The name was also given to the grappling-iron formerly used in naval engagements to hold one ship to another.

Grapple Plant (grap'l), the Cape name of the *Harpagophytum procumbens*, a South African procumbent plant of the nat. order Pedaliaceæ. The seeds have many hooked thorns, and cling to the mouths of grazing cattle, causing considerable pain.

Graptolite (grap'tu-lit), one of a genus (*Graptolithus*) of fossil hydrozoa, agreeing with the living sertularians in having a horny polypary, and in having the separate zooids protected by little horny cups, all springing from a common flesh or cœnosarc, but differing in that they were not fixed



Block of Stone containing Graptolites.

to any solid object, but were permanently free. Graptolites usually present themselves as silvery impressions on hard black shales of the Silurian system, presenting the appearance of fossil pens, etc., whence the name.

Graslitz (grās'lits), a town of Bohemia, on the Zwoda, 89 miles W. N. W. of Prague. It has important manufactures. Pop. 11,803.

Grasmere (grās'mēr), a beautiful lake of England, county of Westmoreland, of oval form, about 1 mile long by ½ mile broad. The village of Grasmere is at the head of the lake.

Grass (grās), a name equivalent to the botanical order Graminaceæ, a very extensive and important order of endogenous plants, comprising about 250 genera and 4500 species, including many of the most valuable pasture-plants, also those which yield corn, the sugar-cane, the tall and graceful bamboo, etc. The nutritious herbage and farinaceous seed furnished by many of them render them of incalculable importance, while the stems and leaves are useful for various textile and other purposes. The roots are fibrous; the stem or culm is usually cylindrical and jointed, varying in length from a few inches to 30 or 90 feet, as in the bamboo (in the sugar-cane and maize the stem is solid, but porous), and coated with silex; leaves, one to each node or joint, with a sheathing petiole; spikelets terminal, panicled, racemose, or spiked; flowers hermaphrodite or polygamous, destitute of true calyx or corolla, surrounded by a double set of bracts, the outer constituting the *glumes*, the inner the *paleæ;* stamens hypogynous, three or six; filaments long and flaccid; anthers versatile; ovary solitary, simple, with two (rarely three) styles, one-celled, with a single ovule; fruit known as a *caryopsis*, the seed and the pericarp being inseparable from each other. The more important divisions of the natural order of grasses are: (1) *Paniceæ*, including the *Panicea* (millet, fundi, Guinea grass); the *Andropogoneæ* (sugar-cane, dhurra, lemon-grass); the *Rottboelliea* (gama-grass); etc. (2) *Phalarideæ* (maize, Job's tears, canary-grass, foxtail-grass, soft-grass, Timothy grass. (3) *Poaceæ*, including the *Oryzea* (rice); *Stipea* (feather-grass, esparto); *Agrostea* (bent-grass); *Avenea* (oats, vernal grass); *Festuceæ* (fescue, meadow-grass, manna-grass, teff, cock's-foot grass, tussac grass, dog's-tail grass); *Bambuseæ* (bamboo); *Hordea* (wheat, barley, rye, spelt, rye-grass, lyme-grass). In its popular use the term grasses is chiefly applied to the pasture grasses as distinct from the cereals, etc.; but it is also applied to some herbs, which are not in any strict sense grasses at all, *e. g.* ribgrass, scurvy and whitlow grass. After the culture of herbage and forage plants became an important branch of husbandry, it became customary to call the clovers, trefoils, sainfoin, and other flowering plants grown as fodder, *artificial grasses*, by way of distinction from the grasses proper, which were termed *natural grasses*. Of the pasture grasses, some thrive in meadows, others in marshes, on upland fields, or on bleak hills, and they by no means grow indiscriminately. Indeed, the species of grass will often indicate the quality of the soil; thus, *Holcus*, *Dactylis*, and *Bromus* are found on sterile land, *Festúca* and *Alopecūrus* on a better soil, *Poa* and *Cynosūrus* are only found in the best pasture land. See *Dog's-tail Grass*, *Fescue*, *Foxtail*, *Meadow-grass*, *Tussac*, etc.

Grass-cloth, the name of certain beautiful light fabrics made in the East from the fiber of *Boehmeria nivea*, or China grass, *Bromelia Pigna*, etc. None of the plants yielding the fiber are grasses. The Queensland

grass-cloth plant, of the nettle order, yields a fine, strong fiber. Cloth has been made from bamboo, and a coarse matting from esparto, both of which are true grasses.

Grasse (gràs), a town of France, department of Alpes Maritimes, 23 miles E. N. E. of Draguignan. It has extensive manufactures of perfumery. There are immense gardens of roses and orange flowers around the town, millions of pounds of flowers being gathered annually for use in perfume-making. Pop. (1911) 19,704.

Grass-finch, Grass-quit, names given to several birds belonging to the finch family, so called from feeding chiefly on the seeds of grasses.

Grass'hopper, the name of various leaping insects of the order Orthoptera nearly akin to the locusts. They are characterized by very long and slender legs, the thighs of the hinder legs being large and adapted for leaping, by large and delicate wings, and by the wing-covers extending far beyond the extremity of the abdomen. Grasshoppers form an extensive group of insects, and are distinguished by the power which

Different Stages in the Metamorphosis of a Grasshopper.

A, larva; *B*, pupa, with the rudimentary wings; *C*, adult, or imago, with the fully developed wings.

they possess of leaping to a considerable distance, and by the stridulous or chirping noise the males produce by rubbing their wing-covers together. They are generally of a greenish color.

Grass of Parnassus, a genus of plants, variously referred to the natural orders Droseraceæ and Hypericaceæ, and found for the most part in boggy situations in the colder northern countries. The common grass of Parnassus (*Parnassia palustris*) is a beautiful autumnal plant with heart-shaped leaves and a single yellowish-white flower.

Grass-oil, Oil of Geranium or Oil of Spikenard, a fragrant volatile oil, used chiefly in perfumery, and obtained from Indian grasses of the genus *Andropogon*.

Grass-tree, the popular name of a genus of Australian plants (*Xanthorrhœa*) of the nat. order

Grass-tree (*Xanthorrhœa hastilis*).

Liliaceæ, having shrubby stems with tufts of long, grass-like, wiry foliage, from the center of which arise the tall flower-stalks, which sometimes reach the height of 15 or 20 feet, and bear dense cylindrical spikes of blossom at their summit. The base of the leaves forms, when roasted, an agreeable article of diet, and the leaves themselves are used as fodder for all kinds of cattle. A resin, known in commerce as *akaroid resin*, is obtained from all the species, which are also popularly known as black-boys.

Grass-wrack, or Sea-grass (*Zostera marina*), a phanerogamous plant belonging to the Naiadeæ, forming green beds at the bottom of the sea where it is of no great depth. When dried it is used for stuffing mattresses, and packing goods. It has been recommended as a substitute for cotton. The ash contains soda.

Gratian (grā'she-an), otherwise Gratianus Augustus, a Roman emperor, eldest son of the Emperor Valentinian I, was born A.D. 359, and when only eight years of age raised by his father to the rank of Augustus. On the death of Valentinian in 375 the Eastern Empire remained subject to Valens, and Gratian was obliged to share the western part with his half-brother, Valentinian II, then four years old. In 378 he succeeded to the Eastern Empire.

which he bestowed on Theodosius I. He was deserted by his soldiers while leading them against Maximus, and put to death at Lyons in the eighth year of his reign.

Gratian, otherwise FRANCISCUS GRATIANUS, a Benedictine of the twelfth century, a native of Chiusi, and author of the *Decretum*, or *Concordia discordantium Canonum*, a rich storehouse of the canon law of the middle ages.

Gratiola (gra-ti'u-la), a genus of plants, the hedge-hyssop genus, nat. order Scrophulariaceæ, containing about twenty species of herbs, widely dispersed through the extratropical regions of the globe. *G. officinalis* grows in meadows in Europe. It is extremely bitter, and acts violently both as a purgative and emetic, and in overdoses it is a violent poison. *G. Virginica* is a native of the United States and has somewhat similar properties, as also *G. Peruviana*, of South America.

Grattan, HENRY, an Irish orator and statesman, born at Dublin in 1746, educated at Trinity College and Middle Temple; called to the Irish bar in 1772, and in 1775 elected member for Charlton in the Parliament of Ireland. In 1780 he moved resolutions asserting the crown to be the only link between Britain and Ireland, and in 1782 led the volunteer movement, which was instrumental in securing the concession of independence to Ireland. For these services the Irish Parliament voted him £50,000 and a house and lands. The corruption of its members and the uncertain relations with England resulted in the failure of 'Grattan's Parliament.' Grattan himself became opposed to the popular feeling as represented by the United Irishmen, and in 1797 temporarily seceded from Parliament, and lived in retirement. In 1800 he came forward as member for Wicklow to oppose the Union, and on the passage of Pitt's measure was returned to the imperial Parliament in 1805 for Malton in Yorkshire, and in 1806 for Dublin. He supported the war policy of the administration, but was latterly chiefly occupied in promoting Catholic emancipation. He died in 1820, and was interred in Westminster Abbey.

Gratz, or GRAZ (grätz), a town of Austria, capital of Styria, picturesquely situated on the Mur, 90 miles southwest of Vienna. The older town, on the left bank, is connected with the suburbs of Lend and Gries on the right by several bridges, besides a railway bridge. The Schlossberg rises 400 ft. above the river, but the fortifications of the town have given place to avenues and pleasure grounds. The cathedral of St. Ægidius, built in 1456, is a majestic Gothic structure with a fine altar and paintings; near it is the mausoleum of Ferdinand II. The university, founded in 1586, has over 1100 students and a library of 80,000 vols. The Joanneum, for the promotion of agriculture and scientific education, has a large library and museums. The manufactures consist of steel and iron ware, soap, confectionery, beer, etc. Pop. (1911) 151,781.

Grätz (grets), HEINRICH, a Jewish historian, born at Xions, Posen, in 1817; died in 1891. In 1854 he became professor in the Jewish theological seminary at Breslau, and in 1870 a professor at the university. His *Geschichte der Juden* (11 vols. 1853–70; new ed. 1865–90; trans. by Bella Löwy, 6 vols. 1891–98) is the standard work on the history of the Jews.

Graudenz (grou'dents), a town of Germany, West Prussia, right bank of the Vistula, 18 miles s. s. w. of Marienwerder. The manufactures include machinery, castings, cigars, tobacco, tapestry, flour, etc., and there are breweries and distilleries. Pop. 40,318.

Gravel (grav'el), a deposit of rounded, water-worn stones. Gravels are produced by the action of moving water, usually of streams or of the sea. In course of time gravels may become consolidated by cementing agents and by pressure and then form 'conglomerate.' The pebbles in a gravel may consist of any kind of rock, but most commonly they are of quartz. In addition to marine and fluviatile gravels, a third group is often recognized—the glacial gravels. These are partly due to the action of running waters, emerging from the melting ice-sheets and glaciers, which wash out the finer materials from the glacial debris. Gravel is extensively used for making concrete and mortar, and as road material. In pathology, gravel consists of small concretions or calculi in the kidneys or bladder. See *Calculus*.

Gravelines (grav-lēn), a small seaport and second-class fortress of France, department Nord. Pop. 6284.

Gravelotte (grav-lot), a village of Germany, province of Elsass-Lothringen, 7 miles west of Metz, the scene of one of the fiercest battles of the Franco-German war, resulting in the retreat of the French to Metz.

Grave Mounds, extensive mounds found in many parts of the United States, especially in the Ohio and Mississippi Valleys, in which occur remains of the old inhabitants, with flint arrowheads and pottery.

They are attributed to a race known as Mound Builders and now supposed to have been the ancestors of the present Indians. Some of these mounds are of great size and occasionally they take the shape of animals. See *Mound Builders.*

Graver. See *Engraving.*

Gravesend (grāvs'end), a municipal and parliamentary borough of England in Kent, on the south bank of the Thames, 21 miles east of London. It is a great rendezvous for shipping, the boundary port of London, and troops and passengers frequently embark there to avoid the passage down the river. In the vicinity are extensive market gardens. There is some trade in supplying ships' stores, and boat-building, iron-founding, etc., are carried on. Pop. 28,117.

Gravina (grä-vē'na), a town of South Italy, province of Bari, on the Gravina. It has a cathedral, convents, and a college. Pop. 18,685.

Graving (grāv'ing), the act of cleaning and repairing a ship's bottom. At seaports this is usually done in a drydock called a *graving-dock.* See *Docks.*

Gravitation (grav-i-tā'shun), the force by reason of which all the bodies and particles of matter in the universe tend towards one another. According to the law of gravitation discovered by Newton, every portion of matter appears to attract every other portion with a force directly proportional to the product of the two masses, and inversely proportional to the square of the distance between them. Kepler had given the laws, deduced from observation, according to which the planets describe their orbits. From these Newton deduced the laws of the force in the case of the planets; and subsequently he generalized the statement of them, by showing the identity of the nature of the force that retains the moon in her orbit, with that which attracts matter near to the surface of the earth. He denied, however, that such a force as attraction could exist and held that the seeming attraction was due to some form of ether pressure or other external cause. The application of the grand law that he had discovered subsequently occupied a large part of the mathematical labors of Newton. Attacking the problem of *lunar inequalities,* he accounted for them by considering the perturbations due to the attraction of various bodies of the solar system; and by accounting for all the observed perturbations by means of his newly-discovered law he confirmed the truth of the law itself in such a way as to put it beyond all question. The computation of these various attractions has reached such a degree of accuracy in the hands of mathematicians since Newton, that the most complicated motions of the heavenly bodies can be predicted. The law has also been applied successfully in weighing the planets, explaining the paths of comets, the motions of the tidal wave, etc. It has also been demonstrated to hold good in the case of comparatively small bodies. Thus Maskelyne determined the attraction of a particular mountain, and Cavendish and Bailly measured the attraction of balls of lead on light, finely-balanced bodies, and thus determined the mean density of the earth.

Gravity (grav'i-ti), the term applied to the force with which the earth is held to attract every particle of matter. The force of gravity is least at the equator, and gradually increases as we recede toward the poles. Thus a given mass, if tested by means of a spring-balance of sufficient delicacy, would appear to weigh least at the equator, and would seem to get heavier and heavier as the latitude increases. This is due to two causes: first, the centrifugal force at the equator is greater than that in high latitudes, because of the greater radius of the circle described at that place; and, second, the attraction is diminished by the greater distance of objects on the surface from the earth's center. From both causes combined a body which weighs 194 lbs. at the equator would weigh 195 lbs. at either pole. Experiments to determine the force of gravity from point to point are made by determining the length of a pendulum that beats seconds at each place. By experiments made by Captain Kater at Leith Fort it was found that the force of gravity at that place is such that a body, unresisted by air or otherwise, would acquire in one second, under its influence, a velocity of 32.207 feet per second. At Greenwich the acceleration is 32.1912 feet.

Gravity, Specific. See *Specific Gravity.*

Gray (grā), a town of France, department of Haute-Saône, on the Saône. It has an active trade. Pop. 6826.

Gray, Asa, botanist, born in 1810 at Paris, Oneida County, New York; died in 1888. He was appointed Fisher professor of natural history in Harvard University in 1842, and held the chair till 1873, when he retired from its more active duties. He gained great eminence as a botanist, his works including *Elements of Botany* (1836), *A Manual*

of Botany (1848), and other botanical text-books; also portions of works on the flora of North America and the *Genera Boreali-Americana*, a *Free Examination of Darwin's Treatise* (1861), a volume entitled *Darwiniana* (1876), etc.

Gray, David, a Scottish poet, born at Merkland, Dumbartonshire, in 1838; studied at Glasgow University, from which he went, with Robert Buchanan, to London in 1860 to try his fortune in literature. After a brief struggle consumption set in, and he died at Merkland in 1861. A small volume containing the poem entitled *The Luggie*, some lyrics, and a few sonnets, with the title *In the Shadows*, represents the whole of his work.

Gray, Elisha, electrician, born at Barnesville, Ohio, in 1835; died in 1901. He was one of the inventors of the telephone, and applied for a caveat for a patent on the same day with A. G. Bell who preceded him only a few hours. He subsequently made improvements in the telephone and invented improved methods of telegraphy.

Gray, George, legislator, was born at Newcastle, Delaware, in 1840, and was admitted to the bar in 1863. He became Attorney-General of Delaware in 1879 and was elected United States Senator in 1885. In 1898 he was appointed a member of the Spanish-American Peace Commission, and was made a U. S. circuit judge in 1899. He was appointed a member of the Permanent Court of Arbitration at The Hague in 1900 and was chairman of the Coal Strike Commission of 1902. He was also a member of the Fisheries Arbitration Commission of 1910.

Gray, Thomas, an English poet, born in London in 1716; educated at Eton with Horace Walpole, and at Cambridge. In 1738 he entered himself at the Inner Temple, but accompanied Walpole in his tour of Europe until they quarreled in Italy. He returned to England in 1741, and on the death of his father took up his residence at Cambridge. In 1747 his *Ode on a Distant Prospect of Eton College* appeared, and in 1751 his famous *Elegy Written in a Country Churchyard*, which went through four editions in two months. In 1757 he declined the laureateship, and the same year published his odes, *On the Progress of Poesy*, and *The Bard*. In 1759 he removed to London, where he resided for three years, and in 1768 the Duke of Grafton presented him with the professorship of modern history at Cambridge. He died in 1771, and was buried at Stoke Pogis, Buckinghamshire. His chief poems other than those mentioned were the *Ode for Music* and a fragmentary essay on the *Alliance of Education and Government*. In Latin verse he is surpassed by few, and his letters are admirable specimens of the epistolary style.

Gray, a color intermediate between black and white.

Gray-lag, a popular name for the *Anser ferus*, or common wild goose. See *Goose*.

Grayling (grā'ling), a genus of fishes of the family Salmonidæ. The common grayling (*Thymallus vulgaris*) is found in many English streams, and is scattered over Europe from Lapland to North Italy, and also over part of Asia. The grayling prefers rapid streams where the water is clear and cool, and the bottom sandy or pebbly, and it requires, on the whole, deeper water than the trout, to which it has a certain similarity in habit. The general color is yellowish brown, including the fins; several deeper brown lines run along the body; under the belly white. The color often varies in different streams. It is a favorite fish of the angler. In North America there is a grayling of different species, *T. tricolor*, which is not only delicate eating, but also furnishes good sport.

Grayling (*Thymallus vulgaris*).

Gray-owl, the tawny-owl (*Strix stridula*), inhabits Northern Europe and America.

Graywacke (grā-wak'e), a metamorphic sandstone in which grains or fragments of various minerals, as quarts and felspar, or of rocks, as slate and siliceous clay rocks, are embedded in an indurated matrix which may be siliceous or argillaceous. The colors are gray, red, blue, or some shade of these. The term, as used by the earlier writers, included all the conglomerates, sandstones, and shales of the older formations, when these had been subjected to considerable change. At first it was nearly synonymous with the Silurian strata, these, especially in Scotland, yielding the only genuine graywacke. The term is now little used.

Grazalema (grā-thā-lā'mā), a town of Spain, in Andalusia, province of Cadiz, on the slope at the foot of a sierra, 38 miles E. N. E. of

Cadiz. It has a handsome Gothic church. Pop. 5587.

Great Barrier Reef, a vast natural breakwater which skirts the coast of Queensland, Australia. It is chiefly of coral formation and more than 1000 miles in length.

Great Barrington, a village of Berkshire County, Massachusetts, on the Housatonic River, 18 miles s. s. w. of Pittsfield, in the picturesque Berkshire Hills. Pop. 5020.

Great Basin, an extensive plateau between the Wasatch and the Sierra Nevada Mountains, comprising the western part of Utah, southern Oregon, nearly all of Nevada, and eastern California; area about 210,000 square miles. Numerous mountain ridges cross it. It is so called from the fact that none of its waters reach the sea, but sink into the sands, evaporate, or flow into some saline lake. Chief among these is the Great Salt Lake of Utah.

Great Bear Lake. See *Bear Lake.*

Great Britain. See the articles *Britain, England, Scotland,* and *Wales.*

Great Circle Sailing, or TANGENT SAILING, a method of navigating a vessel according to which her course is always kept as nearly as possible on a great circle of the sphere, that is, a circle which has for its center the center of the sphere. An arc of such a circle joining two places gives the shortest distance between them, consequently the course of a vessel sailing on this arc will be the shortest possible. A simple instrument called a spherograph is employed for finding the great circle course between places, and this is accompanied by tables compiled for the same purpose.

Great Dane, also called Ulmer dog or German mastiff, a strong handsome dog, which may reach 33 in. in height at the shoulder, carrying the head and neck high, with prick ears. It unites the strength of the mastiff with the elegance of the greyhound. It hunts chiefly by sight, but is usually a kindly, companionable dog, and is in Britain rarely employed in the chase. The hair is short, hard, and dense, the color various shades of gray ('blue'), red, black, or white, with patches of the other colors.

Great Eastern, an iron steamship, length, 680 feet; breadth, 82½, or, including paddle-boxes, 118 feet; height, 58 feet (70 to top of bulwarks). It had six masts, five of iron and one of wood, and could spread 7000 yards of sail, besides having eight engines, divided between the screws and paddles, and capable of working at 11,000 horse-power. Its career was unfortunate, its principal interesting employment being to lay the Atlantic telegraph cable of 1865-66, for which its size and steadiness specially qualified it. Finally, after being used for some time as a show ship, it was sold at auction in 1888 and broken up.

Great Falls, a city, county seat of Cascade Co., Montana, on the Missouri River, which here has a total fall of 500 feet. It has large smelting and reduction works and is an important shipping point for wool. Pop. 13,948.

Greater Punxsutawney, a borough in Jefferson County, Pennsylvania, 45 miles N. W. of Altoona. It is in a coal and iron region. Pop. 9068.

Great Fish River, a river of South-east Africa, near the eastern frontier of Cape Colony. It rises in the Snowy Mountains, and falls into the sea after a course of 230 miles.

Great Fish, or BACK RIVER, a river of Northern Canada, rising in Sussex Lake, and flowing, after a course of about 500 miles, into Cockburn Bay, an inlet of the Arctic Ocean; discovered by Sir George Back.

Great Lakes, a chain of five lakes, forming part of the boundary line between the United States and Canada. See *Erie, Huron, Michigan, Ontario, Superior.*

Great Salt Lake, a lake of Utah, 4000 feet above sea-level, 75 miles in length north to south, with a maximum width of 50 miles. Formerly it covered a much larger area, and had an outlet to the ocean through the Columbia River. The water is so saline that fauna and flora are exceedingly scanty. The specific gravity is so high that the human body cannot sink. Industrially the lake is of great importance for the manufacture of salt. Its chief inlets are the Bear, Ogden, Weber and Jordan river of the Great Basin. It is crossed by the 'Lucin Cut-off' of the Southern Pacific Railroad, which runs on a trestle with 20 miles of 'fill.' There are nine islands in the lake, of which one, Antelope Island, is 18 miles long.

Great Slave Lake. See *Slave Lake.*

Greaves (grēvs), armor worn in mediæval wars on the front of

the lower part of the legs, across the back of which it was buckled.

Grebe (grēb), the common name of the birds of the genus *Podiceps*, family Colymbidæ, characterised by a straight, conical bill, no tail, tarsus

Horned Grebe (*Podiceps cornutus*).

short, toes flattened, separate, but broadly fringed at their edges by a firm membrane, and legs set so far back that on land the grebe assumes the upright position of the penguin. The geographical distribution of the genus is very wide, these birds haunting seas as well as ponds and rivers. They are excellent swimmers and divers; feed on small fishes, frogs, crustaceans, and insects; and their nests, formed of a large quantity of grass, etc., are generally placed among reeds and sedges, and rise and fall with the water. Five species are European and nine are North American, some of them (crested grebe, horned grebe) being the same as those of Europe. The great crested grebe is about 21 to 22 inches long, and has been called satin grebe from its beautiful silvery breast-plumage, much esteemed as material for ladies' muffs.

Greece (grēs), a country, now a kingdom, of Southeastern Europe, the earliest portion of this continent to attain a high degree of civilization, and to produce works of art and literature of a high type. It forms the southern extremity of what is called the Balkan Peninsula, and itself partly consists of a well-marked peninsula, the Morea or Peloponnesus, united to Northern Greece by the Isthmus of Corinth. The name Greece (Latin, *Græcia*) is of Roman origin, the native name for the country being *Hellas*, and the people calling themselves *Hellēnes*. Anciently Hellas was used in a wider sense, so as to include both Greece itself and all countries that had become Greek by colonization. Modern Greece is separated from Albania, Servia and Bulgaria on the north by an artificial boundary extending from the Ionian Sea to a point beyond Kavala on the Ægean Sea, and comprises rather less than ancient Greece, which also took in part of what is now Albania. Ancient Greece was divided into a number of independent states or territories, namely, in Northern Greece, Thessaly, Epirus (not in the modern kingdom), Locris, Phocis, Bœotia, Ætolia, Acarnania, Attica, Megaris; in the Peloponnesus, Corinth, Argolis, Achaia, Elis, Messenia, Laconia (Sparta), and Arcadia, the last entirely inland. These names are still kept up, but the country is now divided into nomes, or *nomarchies*, some of which are formed of the Greek islands, namely, Eubœa, Corfu, Cephalonia, Zante, and the Cyclades. The total area is 46,522 square miles; the population 4,600,000.

Physical Features.—Greece proper is remarkable for the extent of its coast-line, formed by numerous gulfs which penetrate into it in all directions. The largest, the Corinthian Gulf, or Gulf of Lepanto, on the east, and the Saronic Gulf, or Gulf of Ægina, on the west, which nearly meet at the Isthmus of Corinth, separate Northern Greece from the Morea. This isthmus, however, has recently been pierced by a ship-canal and is no longer an obstruction to commerce. Another striking feature is the mountainous character of the interior. On the north are the Cambunian Mountains, with Mount Olympus (9754 ft.) at their eastern extremity. From this range a lofty chain, called Mount Pindus, runs southwards almost parallel to the eastern and western coasts of Greece. At a point in this chain called Mount Tymphrestus or Typhrestus (Mount Velukhi) two chains proceed in an easterly direction, the northern being called Mount Othrys, the southern terminating at Thermopylæ, Mount Œta (8240 ft.). The Cambunian Mountains, Pindus and Othrys, enclose the fertile vale of Thessaly, forming the basin of the Peneus (Salambria), and the ranges of Othrys and Œta inclose the smaller basin of the Sperchius (Hellada). Another range, that of Parnassus (highest summit 8068 ft.), branches off from Mount Œta and runs still more to the south. The peaks of Cithæron, Parnes, Pentelicus, and Hymettus lie in the same direction, and the range in which they are found is continued to the southeast point of continental Greece. This range on the south and that of Œta on the north enclose the basin of the Cephissus, with Lake Copais. The chief rivers on the west side of the Pindus chain are the Arachtus (Arta) and the Achelōus (Aspropotamo). The chief feature in the mountain system of the Peloponnesus is a range or series of ranges forming a circle round the valley of Arcadia in the interior, having a number of branches proceeding outwards from it in different directions. The highest range in the Peloponnesus, Mount Tay-

getus (7904 feet), branches off from the circle round Arcadia, strikes southwards, and terminates in the promontory of Tænarum (Cape Matapan). The chief rivers in the Peloponnesus are the Eurotas (Basilipotamo), the Alpheus (Ruphia), draining Arcadia and Elis; and the Peneus, draining Elis. The rock most largely developed in the mountains of Greece is limestone, which often assumes the form of the finest marble. Granite occurs in patches. Tertiary formations prevail in the northeast of the Peloponnesus; and in the northwest, along the shores of Elis, are considerable tracts of alluvium. Silver, lead, zinc, and copper are found and worked to some extent, the famous ancient silver mines of Laurium in Attica still yielding some silver.

Climate.—The climate is generally mild, in the parts exposed to the sea equable and genial, but in the mountainous regions of the interior sometimes severely cold. None of the mountains attain the limit of perpetual snow; but several retain it far into the summer. In general the first snow falls in October and the last in April. During summer rain scarcely ever falls, and the channels of the minor streams become dry. Towards the end of harvest rain becomes frequent and copious; and intermittent fevers, etc., become common. In ancient times, when the country was more thickly peopled and better cultivated, the climate seems to have been better.

Vegetation, Agriculture, etc.—Greece is mainly an agricultural country, though agriculture is in a somewhat backward state. The land is largely held by peasant proprietors. The principal crops are wheat, barley, and maize. The cultivated land produces all the fruits of the latitude—figs, almonds, dates, oranges, citrons, melons, etc. The vine also grows vigorously, as it did in ancient Greece. But a much more important product of Greece, especially on the coasts of the Peloponnesus, and in the islands of Cephalonia, Zante, Ithaca, and Santa Maura, is the Corinthian grape or currant. The olive is also largely grown (as in ancient times), and the culture of the mulberry, for the rearing of silkworms, has recently been greatly extended. The extensive forests contain among other trees a peculiar kind of oak (*Quercus Ægilops*), which yields the valonia of commerce. The domestic animals are neither numerous nor of good breeds. Asses are almost the only beasts of burden employed: and dairy produce is obtained from the sheep and the goat.

Manufactures, Trade, Communications, etc.—The manufactures are extremely limited, but, with all other branches of industry in Greece, are increasing. They include cottons, woolens, earthenware, leather, etc., and shipbuilding is carried on largely at various points of the coast, and at the Piræus. A large part of the shipping of Greece is engaged in the carrying trade between Britain, Germany, etc., and Greece, Turkey, and other Mediterranean countries. The chief ports are Corfu, Syra, Piræus (the port of Athens), and Patras. The principal exports are currants and olive oil; but valonia, emery, silk, dried figs, raisins, honey, wax, leather, tobacco, and other articles are also exported. The principal imports are cereals, cotton, woolen, and silk goods, sugar, iron goods, coffee, etc. The greatest hindrance to the development of Greece at the present time is the want of good roads, but this is being gradually remedied. The mountainous character of the country greatly restricts railroad building and only a few hundred miles are in operation. The money unit of Greece is the *drachma* of 100 *lepta*, which is nominally 1 franc.

Constitution, etc.—According to the present constitution, the throne is hereditary in the family of King George (second son of the late King of Denmark). The legislative authority is vested in a single chamber, called the Boulê, the members of which (proportioned in number to the amount of the population) are elected for four years by ballot by manhood suffrage. The executive power rests with the king and ministry. The Greek Church alone is established, but all forms of religion enjoy toleration. Justice is administered, on the basis of the French civil code, by a supreme court (*Areios Pagos*), at Athens; four royal courts (*Ephiteis*), at Athens, Nauplia, Patras, and Corfu; sixteen courts of primary resort (*Protodokeia*), one in each principal town. The public revenue, derived chiefly from customs, land tax, tobacco and petroleum monopoly, state domains and national property, etc., was estimated for 1910 at $29,750,000; the expenditure $29,210,000. Greece has a large debt, the total for 1910 being about $170,000,000. All able-bodied males are liable to military service during a term of nineteen years, of which in the infantry one year and in special corps two years must be spent with the colors, the remainder in the reserve and in the landwehr or militia. In 1910 the total nominal strength of the army was 50,000. The navy consisted of three small ironclads, and a number of gunboats and torpedo boats.

People.—The ancient Greeks were an Aryan race, probably most closely akin to

the Italian peoples. They were noted for physical beauty and intellectual gifts. The present population contains a considerable intermixture of foreign stocks, among which the Albanese, or Arnauts, are the most numerous; but the great majority, though not without some taint in their blood, are of Greek extraction. While the population of Greece proper, at the last census, was as above given, the whole Greek nationality reaches nearly 8,000,000, of whom 3,500,000 are found in European Turkey and 2,000,000 in Asia Minor. Education in Greece is free and compulsory in theory (from the age of five to twelve), but a large proportion of the people can neither read nor write. There are three grades of schools, the primary national schools, the Hellenic or secondary grammar schools, and the gymnasia, which are higher grammar schools or colleges. In addition there is a university at Athens.

The national dress of the Greeks resembles the Albanian costume. For the men it consists of a tight jacket, generally scarlet, wide trousers descending as far as the knee, and embroidered gaiters; for the women it consists of a vest fitting close to the shape, and a gown flowing loosely behind.

History.—The earliest inhabitants of Greece were the Pelasgians, of whom little or nothing is known with certainty. To them are attributed certain remains of ancient buildings, especially the so-called Cyclopean works in the Peloponnesus. The Pelasgians were succeeded by the Hellenes, or Greeks proper, who may have been simply one of the Pelasgian tribes or races. To the early period of the Hellenic occupation of Greece belong the legends of the Trojan War, of Theseus, of Jason and the Argonauts, etc. The Hellenes were divided into four chief tribes—the Æolians, occupying the northern parts of Greece (Thessaly, Bœotia, etc.); the Dorians, occupying originally a small region in the neighborhood of Mount Œta; the Achæans, occupying the greater part of the Peloponnesus; and the Ionians, occupying the northern strip of the Peloponnesus and Attica. Of the four principal tribes the Ionians were most influential in the development of Greece. The distribution of the Hellenic tribes was greatly altered by the Dorian migration, sometimes called 'the return of the Heracleidæ' (descendants of Hercules), placed by Thucydides about eighty years after the fall of Troy, or about B.C. 1104, according to the ordinary but questionable chronology. Before the great migration several smaller ones had taken place, causing considerable disturbance; and at last the hardy Dorian inhabitants of the mountainous region about Mount Œta conquered a large part of Northern Greece, and then entered and subdued the greater part of the Peloponnesus, driving out or subjugating the Achæans, as the Achæans had the Pelasgians. In the legend the Dorians are represented as having entered the Peloponnesus under Temenus, Cresphontes, and Aristodemus, three descendants of Heracles (Hercules), who had come to recover the territory taken from their ancestors by Eurystheus. Of the Achæan inhabitants of the Peloponnesus a large section occupied the territory formerly in possession of the Ionians, henceforward called Achaia. The Ionians driven out of the Peloponnesus found at first a refuge among their kindred in Attica, but owing to its limited territory were soon compelled to leave it and found Ionic colonies on several of the islands of the Ægean Sea and on the middle part of the coast of Asia Minor, where they built twelve cities, later forming an Ionic Confederacy. The principal of these were Ephesus and Miletus. About the same time another body of Greeks, from Thessaly and Bœotia, are said to have founded the Æolian colonies on some of the northern islands of the Ægean, and on the northern part of the western coast of Asia Minor. The Æolic colonies of Asia Minor also formed a confederacy of twelve cities, afterwards reduced to eleven by the accession of Smyrna to the Ionic Confederacy. The southern islands and the southern part of the west coast of Asia Minor were in like manner colonized by Dorian settlers. The six Doric towns in Asia Minor, along with the island of Rhodes, formed a confederacy similar to the Ionic and Æolic ones.

In course of time many Greek settlements were made on the coasts of the Hellespont, the Propontis (Sea of Marmora), and the Black Sea, the most important being Byzantium (Constantinople), Sinope, Cerasus, and Trapezus (Trebizonde). There were also flourishing Greek colonies on the coasts of Thrace and Macedonia; for example, Abdera, Amphipolis, Olynthus, Potidæa, etc.; and the Greek colonies in Lower Italy were so numerous that the inhabitants of the interior spoke Greek, and the whole region received the name of Greater Greece (Magna Græcia). The most famous of the Greek colonies in this quarter were Tarentum, Sybaris, Croton, Cumæ, and Neapolis (Naples). Sicily also came to a great extent into the hands of the Greeks, who founded on it or enlarged many towns, the largest, most powerful

and most highly cultured of the Greek colonies here being the Corinthian colony of Syracuse, founded in the eighth century B. C. Other important colonies were Cyrene on the north coast of Africa, and Massilia (Marseilles) on the south coast of Gaul. All these colonies as a rule preserved the customs and institutions of the mother city, but were quite independent.

Although ancient Greece never formed a single state, the various Greek tribes always looked upon themselves as one people, and classed all other nations as *Barbaroi* (foreigners). There were four chief bonds of union between the Greek tribes. First and chiefly they had a common language, which, despite its dialectic peculiarities, was understood throughout all Hellas or the Greek world. Secondly, they had common religious ideas and institutions, and especially, in the oracle of Delphi, a common religious sanctuary. Thirdly, there was a general assembly of the Greeks, the Amphictyonic League, in which the whole people was represented by tribes (not by states), and the chief functions of which were to guard the interests of the sanctuary of Delphi, and to see that the wars between the separate states of Greece were not too merciless. The fourth bond consisted in the four great national festivals or games, the Olympian, Isthmian, Nemean, and Pythian, on the first of which the whole of Greece based its calendar.

The various separate states of Greece may be divided, according to the form of their constitution, into the two great classes of aristocratic and democratic. Sparta or Lacedæmon, the chief town of Laconia and of the Doric tribe, was the leading aristocratic state; and Athens, the capital of Attica and the chief town of the Ionic tribe, was the leading democratic state; and as a rule all the Doric states, and subsequently all those under the influence of Sparta, resembled that city in their constitution; and all the Ionic states, and those under the influence of Athens, resembled it. These two tribes or races are the only ones that come into prominence during the earlier part of Greek history subsequent to the Doric migration. Sparta is said to have derived its form of government, and all its institutions, in the ninth century B. C., from Lycurgus, whose regulations developed a hardy and warlike spirit among the people, the results of which were seen in their conquests over surrounding states, especially over the Messenians in the eighth and seventh centuries B. C.

The constitution of Athens appears from the legends of Theseus and Codrus to have been at first monarchical, and afterwards aristocratic, and to have first received a more or less democratic character from Solon at the beginning of the sixth century B.C. This was followed about fifty years later by a monarchical usurpation under Pisistratus, and his sons Hippias and Hipparchus, the last survivor of whom, Hippias, reigned in Athens till 510 B.C. After the expulsion of Hippias the republic was restored, under the leadership of Cleisthenes, in a more purely democratic form than at first. A brief struggle with the Spartans, whose aid was invoked by some of the nobles, now took place, and Athens emerged from it well prepared for the new danger which threatened Greece.

The Greek colonies in Asia Minor and the adjacent islands, after being conquered by Crœsus, king of Lydia, fell with the fall of Crœsus into the power of Cyrus, king of Persia. In B. C. 500, however, the Ionians revolted with the assistance of the Athenians and Eretrians, and pillaged and burned Sardis. The rebellion was soon crushed by Darius, who destroyed Miletus, and prepared to invade Greece. In 492 he sent an expedition against the Greeks under his son-in-law Mardonius, but the fleet which carried his army was destroyed in a storm off Mount Athos. A second army, under the command of Datis and Artaphernes, landed on Eubœa, and after destroying Eretria, crossed the Euripus into Attica; but it was totally defeated in B.C. 490 on the plain of Marathon by 10,000 Athenians and 100 Platæans, under Miltiades. In the midst of preparations for a third expedition Darius died, leaving his plans to be carried out by his son Xerxes, who, with an army of 1,700,000 men, crossed the Hellespont in 481 by means of two bridges of boats, and marched through Thrace, Macedonia, and Thessaly, while his fleet followed the line of coast. In the pass of Thermopylæ he was held in check by Leonidas with 300 Spartans and 700 Thespians; but the small band was betrayed and annihilated (480 B.C.); and the way through Phocis and Bœotia being now open he advanced into Attica, and laid Athens in ruins. The deliverance of Greece was chiefly due to the genius and courage of Themistocles. The united fleet of the Greeks had already contended with success against that of the Persians off Artemisium, and had then sailed into the Saronic Gulf, followed by the enemy. Themistocles succeeded in inducing the Persians to attack in the narrow strait between Attica and Salamis, and totally defeated them.

From a neighboring height Xerxes himself witnessed the destruction of his fleet,

and at once began a speedy retreat with his land army through Thessaly, Macedonia, and Thrace, leaving behind him 300,000 men in Thessaly. In the spring of the following year (479) these advanced into Attica and compelled the citizens once more to seek refuge in Salamis; but were so completely defeated at Platæa by the Greeks under Pausanias, that only 40,000 Persians reached the Hellespont. On the same day the remnant of the Persian fleet was defeated by the Greeks off Mount Mycale.

The brilliant part taken by the Athenians under Themistocles in repelling this invasion of Athens greatly increased her influence throughout Greece. From this date begins the period of the leadership or *hegemony* of Athens in Greece, which continued to the close of the Peloponnesian war, 404 B.C. The first thing which Athens exerted her influence to effect was the formation of a confederacy, including the Greek islands and maritime towns, to supply means for the continuance of the war by payments into a common treasury established on the island of Delos, and by furnishing ships. In this way Athens gradually increased her power so much that she was able to render tributary several of the islands and smaller maritime states. In 469 B.C. the series of victories won by the Athenians over the Persians was crowned by the double victory of Cimon over the Persian fleet and army on the Eurymedon, in Asia Minor, followed by the Peace of Cimon, which secured the independence of all Greek towns and islands. Shortly after followed the brilliant administration of Pericles, during which Athens reached the height of her grandeur.

The position of Athens, however, and the arrogance and severity with which she treated the states that came under her power made her many enemies. In the course of time two hostile confederacies were formed in Greece, one consisting of Athens and the democratic states of Greece; the other of Sparta and the aristocratic states. At last, in 431, war was declared by Sparta on the complaint of Corinth that Athens had furnished assistance to Corcyra in its war against the mother city; and on that of Megara, that the Megarean ships and merchandise were excluded from all the ports and markets of Attica; and thus began the Peloponnesian war which for twenty-seven years devastated Greece.

In the first part of the war the Spartans, who invaded Attica in 431 B.C. and three times in the five years following, had considerable successes, which were aided by the pestilence that broke out at Athens and the death of Pericles. In 425, however, Pylos was captured by the Athenian general Demosthenes, and the Spartan garrison in the island of Sphacteria was compelled to surrender to Cleon. Soon after Cythera fell into the hands of the Athenians, but they were defeated in Bœotia at Delium (424) and at Amphipolis in Thrace by Brasidas in 422, when both Cleon and Brasidas were killed. The Peace of Nicias (421 B.C.), which followed the death of Cleon, brought disaffection into the Spartan Confederacy, the Corinthians endeavoring with Argos and Elis to wrest from Sparta the hegemony of the Peloponnesus. In this design they were supported by Alcibiades; but Sparta was victorious at the battle of Mantinea in 418. Soon after this the Athenians resumed hostilities, fitting out in 415 B.C. a magnificent army and fleet, under the command of Alcibiades, Nicias, and Lamachus, for the reduction of Syracuse. Alcibiades, however, being subsequently deprived of his command on a charge of impiety, betook himself to Sparta, and exhorted the city to renew the war with Athens. By his advice one Spartan army was despatched to Attica, where it took up such a position as prevented the Athenians from obtaining supplies from Eubœa, while another was sent under Gylippus to assist their kindred in Sicily. These steps were ruinous to Athens. The Athenian army and fleet at Syracuse were completely destroyed, and though the war was maintained with spirit the prestige of Athens was seriously diminished. Many of her allies joined Sparta, and a revolution and brief change of government tended still further to weaken her. Still she made not unsuccessful efforts to regain her position, conquered the revolted towns about the Bosporus, and defeated the Spartan admiral Callicratidas off the islands of Arginusæ in 406. Sparta, however, was now in receipt of Persian aid, and Lysander, having captured nearly the whole Athenian fleet at Ægospotamos (405), retook the towns of Asia Minor, surrounded Athens, and blocked the Piræus. In 404 B.C. the Athenians were starved into surrender, the fortifications were destroyed, and an aristocratic form of government was established by Sparta, in which the supreme power was placed in the hands of thirty individuals, commonly known as the Thirty Tyrants. Only a year later, however (403), Thrasybulus was able to re-establish the democracy.

The period which follows the fall of Athens is that of Sparta's leadership or hegemony in Greece, which lasted till the

battle of Leuctra, in 371 B.C. The Spartan rule was not more liked than that of Athens, and the character of the Spartan state itself, with its increase of wealth and power, underwent great change. To escape the stigma of having ceded the cities of Asiatic Greece to Persia, Agesilaus was sent to retake them, but was defeated by the fleet of Pharnabasus under Conon the Athenian; and the states of Greece, the Spartans included, at last, in 387, agreed to the disgraceful Peace of Antalcidas, by which the whole west coast of Asia Minor was ceded to the Persians. An act of violence committed by a Spartan general in garrisoning Thebes in 380 was the commencement of the downfall of Sparta. The Thebans revolted under Pelopidas and Epaminondas, and the Spartans on invading Bœotia were so completely defeated at Leuctra in 371 B.C. that they never fully recovered from the blow. With this victory Thebes won the leading place in Greece, which she maintained during the lifetime of Epaminondas, whose influence was paramount in the Peloponnesus. Epaminondas fell in defeating the Spartans and Arcadians near Mantinea in 362, and his death reduced once more the authority of Thebes in Greece.

Two years after the death of Epaminondas, Philip, the father of Alexander the Great, became king of Macedonia. An occasion for interference in the affairs of Greece was furnished him by the war known as the Sacred war (355-346), arising from the Phocians having taken possession of some of the land belonging to the sanctuary of Delphi. The Phocians were besieged by the Thebans, who called in the aid of Philip of Macedon, who was accorded the place till then held by the Phocians in the Amphictyonic League. It was not, however, till the Locrian war (339-338) that Philip acquired a firm hold in Greece. The Locrians had committed the same offense as the Phocians, and Philip, as one of the members of the league, received the charge of punishing them. The real designs of Philip soon became apparent, and the Athenians, on the advice of Demosthenes, hastily concluded an alliance with the Thebans, and sent an army to oppose him. The battle of Chæronea which ensued (338) turned out, however, disastrously for the allies, and Philip became master of Greece. He then collected an army for the invasion and conquest of the rotten empire of Persia, and got himself declared commander-in-chief by the Amphictyonic League at Corinth in 337 B.C.; but before he was able to start he was assassinated, B.C. 336.

The design of Philip was taken up and carried out by his son Alexander the Great, during whose absence Antipater was left behind as governor of Macedonia and Greece. Soon after the departure of Alexander, Agis III of Sparta headed a rising against Antipater, but was defeated at Megalopolis in 330 B.C., and no other attempt was made by the Greeks to recover their liberty for nearly a hundred years. At the close of the wars which followed the death of Alexander, and which resulted in the division of his empire, Greece remained with Macedonia.

The last efforts of the Greeks to recover their independence proceeded from the Achæans, who, though frequently mentioned by Homer as taking a prominent part in the Trojan war, had for the most part kept aloof from the quarrels of the other states, and did not even furnish assistance to repel the Persian invasion. They had taken part, though reluctantly, in the Peloponnesian war on the side of Sparta, and had shared in the defeat of Megalopolis in B.C. 330. In the course of the first half of the third century B. C. several of the Achæan towns expelled the Macedonians, and revived an ancient confederacy, which was now known as the Achæan League. Aratus of Sicyon became its leading spirit. It was joined also by Corinth, and even by Athens and Ægina. The Spartans, however, who had maintained their independence against Macedonia, naturally looked with jealousy on the efforts of Aratus, and during the reign of Cleomenes a war broke out between Sparta and the Achæan League. The league was at first worsted, and was only finally successful when Aratus sacrificed the ultimate end of the league by calling in the aid of the Macedonians. In the battle of Sellasia (222 B.C.) Cleomenes was defeated, and the Macedonians became masters of Sparta. Aratus died in 213, and his place was taken by Philopœmen, 'the last of the Greeks,' who succeeded in making the league in some degree independent of Macedonia.

About this time the Romans, who had just come out victorious from a second war with Carthage, found occasion to interfere in the affairs of Greece. Philip V of Macedon having allied himself with Hannibal, the Romans sent over Flamininus to punish him, and in this war with Philip the Romans were joined by the Achæan League. Philip was defeated at Cynocephalæ in 197 B.C., and was obliged to recognize the independence of Greece. The Achæan League thus became supreme in Greece, having been

joined by all the states of the Peloponnesus. But the league itself was in reality subject to Rome, which found constant ground for interference until 147 B.C., when the league openly resisted the demand of the senate, that Sparta, Corinth, Argos, and other cities, should be separated from it. In the war which ensued, which was concluded in 146 B.C. by the capture of Corinth by the Roman consul Mummius, Greece completely lost its independence, and was subsequently formed into a Roman province.

On the divison of the Roman Empire Greece fell of course to the eastern or Byzantine half. From 1204 to 1261 it formed a part of the Latin Empire of the East, and was divided into a number of feudal principalities. In the latter year it was reannexed to the Byzantine Empire, with which it remained till it was conquered by the Turks between 1460 and 1473. In 1699 the Morea was ceded to the Venetians, but was recovered by the Turks in 1715. From 1715 till 1821 the Greeks were without intermission subject to the domination of the Turks. In 1770, and again in 1790, they made vain attempts at insurrection, but in 1821 Ali, the pasha of Janina, revolted against the Sultan Mahmoud II, and secured the aid of the Greeks by promising them their independence. The rising of the Greeks took place on the 6th of March, under Alexander Ypsilanti, and on the 1st of January, 1822, they published a declaration of independence. In the same year Ali was assassinated by the Turks, but the Greeks, encouraged by most of the European nations, continued the struggle under various leaders, of whom the chief were Marcos Bozzaris, Capo d'Istria, Constantine Kanaris, Kolocotroni, etc. In 1825 the Turks, with the aid of Ibrahim Pasha, took Tripolitza, the capital of the Morea, and Missolonghi, and though Lord Cochrane organized the Greek fleet, and the French colonel Fabvier their army, the Turks continued to triumph everywhere. A treaty was then concluded at London (July 6, 1827) between Britain, France, and Russia, for the pacification of Greece, and when the mediation of these three powers was declined by the sultan, their united fleets, under Admiral Codrington, annihilated the Turkish fleet off Navarino, October 20, 1827. In the beginning of the following year (1828) Count Capo d'Istria became president of the state, and later on in the same year Ibrahim Pasha was forced to evacuate Greece. At last, on the 3d of February, 1830, a protocol of the allied powers declared the independence of Greece, which was recognized by the Porte on the 25th April of this year. The crown was offered to Leopold, prince of Saxe-Coburg, and when he refused it, to Otho, a young prince of Bavaria, who was proclaimed King of the Hellenes at Nauplia in 1832. But his arbitrary measures, and the preponderance which he gave to Germans in the government, made him unpopular, and although after a rebellion in 1843 a constitution was drawn up, he was compelled by another rebellion in 1862 to abdicate. A provisional government was then set up at Athens, and the National Assembly offered the vacant throne in succession to Prince Alfred of England and Prince William George of Denmark. The latter accepted it, and on March 30, 1863, was proclaimed as King George I. In 1864 the Ionian Islands, which had hitherto formed an independent republic under the protection of Britain, were annexed to Greece. The promises of extension northward held out to Greece by the Berlin congress were in danger of being withdrawn, but the persistence of Greece led in 1881 to the cession to her of Thessaly and part of Epirus, or about one-third less than the territory promised at Berlin. The situation, however, always remained somewhat strained. The union of Eastern Roumelia with Bulgaria, in 1885, gave rise to a demand for a rectification of frontiers, and war with Turkey was only prevented by the great powers, which enforced the reduction of the Greek army to a peace footing by blockading the Greek ports. The same occurred in 1896, when war was declared against Turkey on the people of Crete demanding their right to become a portion of Grecian territory. The result was disastrous to their aspirations, Turkey pouring troops into Thessaly and utterly defeating the Greek troops. In 1909 Greece made another unsuccessful attempt to obtain possession of Crete. In 1912 Greece joined with the neighboring states in a war against Turkey. By the treaty of Bukarest she acquired additional territory, including Salonika and Kavala. George I was killed by an anarchist in 1913 and succeeded by Constantine I, whose pro-German policy obstructed the projected operations of the British and French forces at Salonika, and this led, on June 13, 1917, to the deposition of Constantine by France and Great Britain. His second son, Alexander, who was anti-German in sentiment, was placed on the throne. Venizelos, the former premier, was restored to power and the Greek policy changed.

Religion of Ancient Greece.—The religion of the ancient Greeks was polytheism, there being a great number of

divinities, many of whom must be regarded as personifications of natural powers, or of phenomena of the external world, personified sentiments, etc. Thus there were gods corresponding to Earth and Heaven, the Ocean, Night, etc. The Romans, when they became acquainted with the literature and religion of the Greeks, identified the Greek deities with those of their own pantheon. In this way the Greek and Roman deities came to be confounded together, and the names of the latter even came to supersede those of the former. The supreme ruler among the gods was Zeus (Roman Jupiter or Juppiter), the son of Kronos (Roman Saturn), who after the subjugation of the Titans and Giants ruled in Olympus, while his brother Pluto reigned over the lower world (Hades, Tartarus), and Poseidōn (Neptune) ruled in the sea. Like reverence was paid to Hēra (Juno), the sister and wife of Zeus, and the queen of Heaven; to the virgin Pallas Athēnē (Minerva); to the two children of Lētō (Latona), namely, Apollo, the leader of the Muses, and his sister the huntress Artēmis (Diana), the goddess of the moon; to the beautiful daughter of Zeus, Aphroditē (Venus), the goddess of love; to Arēs (Mars), the god of war, Hermēs (Mercury), the herald of the gods, and others besides. In addition to these there was an innumerable host of inferior deities (Nymphs, Nereids, Tritons, Sirens, Dryads and Hamadryads, etc.) who presided over woods and mountains, fields and meadows, rivers and lakes, the seasons, etc. There was also a race of heroes or demigods (such as Heracles or Hercules, Perseus, etc.) tracing their origin from Zeus, and forming a connecting link between gods and men, while on the other hand the Satyrs formed a connecting link between the race of men and the lower animals. The true teachers of the Greek religion were the poets and other writers, and it is to the hymns, epics, dramas, and histories of the Greeks that we must turn in order to learn how they regarded the gods. No degree of consistency is to be found in them, however, the personality and local origin of the writers largely moulding their views. A belief in the justice of the gods as manifested in the punishment of all offences against them was cardinal. The man himself might escape, but his children would suffer, or he might be punished in a future state—the latter view being less commonly held than the former of an entailed curse. The gods are also represented by the Greeks as holy and truthful, although they are in innumerable other passages described as themselves guilty of the grossest vices, and likewise as prompting men to sin, and deceiving them to their own destruction. In their general attitude towards men the gods appear as inspired by a feeling of envy or jealousy. Hence they had constantly to be appeased, and their favor won by sacrifices and offerings. Certain classes were, however, under the peculiar protection and favor of the gods, especially strangers and suppliants. The Greeks believed that the gods communicated their will to men in various ways, but above all, by means of oracles, the chief of which were that of Apollo at Delphi, and that of Zeus at Dodona. Dreams ranked next in importance to oracles, and divination by birds, remarkable natural phenomena, sneezing, etc., was practised. The Greeks appear to have had at all times some belief in a future existence, but in the earliest times this belief was far from being clearly defined.

Greece, Language of.—The Greek language belongs to the Indo-European group, and is thus a sister of the Sanskrit, Latin, Teutonic, and Celtic tongues. It is customary to distinguish three leading dialects according to the three leading branches of the Greeks, the Æolic, the Doric, and the Ionic, to which was afterwards added the mixed Attic dialect; besides these there are several secondary dialects. Akin to the Ionic is the so-called Epic dialect, that in which the poems of Homer and Hesiod are written, and which was afterwards adopted by other Epic writers. The Doric was hard and harsh; the Ionic was the softest. The Æolic was spoken on the north of the Isthmus of Corinth (except in Megara, Attica, and Doris), in the Æolian colonies of Asia Minor, and on some of the northern islands of the Ægean Sea. The Doric was spoken in the Peloponnesus, in Doris, in the Doric colonies of Asia Minor, of Lower Italy (Tarentum), of Sicily (Syracuse, Agrigentum); the Ionic in the Ionian colonies of Asia Minor, and on the islands of the Archipelago; and the Attic in Attica. In each of these dialects there are celebrated authors. The Ionian dialect is found pure in Herodotus and Hippocrates. The Doric is used in the poems of Pindar, Theocritus, Bion, and Moschus. In Æolic we have fragments of Alcæus and Sappho. After Athens had obtained the supremacy of Greece, and rendered itself the center of all literary cultivation, the masterpieces of Æschylus, Sophocles, Euripides, Aristophanes, Thucydides, Xenophon, Plato, Aristotle, Isocrates, Demosthenes, etc., made the

Attic the common dialect of literature. Grammarians afterwards distinguished the genuine Attic, as it exists in those masters, from the Attic of common life, calling the latter the *common Greek* or *Hellenic* dialect. In this latter dialect wrote Theophrastus, Apollodorus, Polybius, Plutarch, and others. Many later writers, however, wrote genuine Attic, as Lucian, Ælian, and Arrian. Except the dramatists, the poets by no means confined themselves to the Attic; the dramatists themselves assumed the Doric, to a certain degree, in their choruses, and the other poets retained the Homeric style, which was a congeries of forms occurring as peculiarities in the various dialects.

At what time this language first began to be expressed in writing has long been a subject of doubt. According to the usual account Cadmus the Phœnician introduced the alphabet into Greece; and it is an undoubted fact that the most of the Greek letters are derived from the Phœnician ones. The Greek alphabet possesses the following twenty-four letters:

Α, α (alpha), a; Β, β (beta), b; Γ, γ (gamma), g; Δ, δ (delta), d; Ε, ε (epsilon), ĕ; Ζ, ζ (zeta), z; Η, η (eta), ē; Θ, θ (theta), th; Ι, ι (iota), i; Κ, κ (kappa), k; Λ, λ (lambda), l; Μ, μ (mu), m; Ν, ν (nu), n; Ξ, ξ (xi), x; Ο, ο (omicron, i.e. small o), ŏ; Π, π (pi), p; Ρ, ρ (rho), r; Σ, σ, ς (sigma), s; Τ, τ (tau), t; Υ, υ (upsilon), u, usually transliterated by y; Φ, φ (phi), ph; Χ, χ (chi), ch guttural (as in Scotch *loch*); Ψ, ψ (psi), ps; Ω, ω (omega, or great o), ō. The alphabet originally introduced into Greece is said to have consisted of but sixteen letters: Θ Ξ Φ Χ Ψ Η Υ Ω being of later introduction.

Modern Greek, as spoken by the uneducated classes, is called Romaic, from the fact that those who speak it considered themselves before the descent of the Turks upon Europe as belonging to the Roman Empire, and hence called themselves *Romaioi*, or Romans. The Greek of the educated classes, that used in the newspapers and other literature of the present day, is distinguished from it by a greater resemblance to the Greek of antiquity, which renders it easy for any one who has a satisfactory acquaintance with ancient Greek to read the modern literary Greek. Besides the foreign words introduced into modern Greek, many words have changed their original signification. The grammar has also undergone considerable modification. For example, the numbers have been reduced to two by the suppression of the dual; and the cases to four by the disappearance of the dative, which is now expressed by a preposition with the accusative. The first cardinal numeral is now used as an indefinite article. The degrees of comparison are sometimes expressed by the use of *pleon* (more). The past and future tenses are formed by the aid of the verbs *echō* (I have), and *thelō* (I will). The infinitive mood has its place supplied by a periphrasis with the verb in the subjunctive, and the middle voice has disappeared. The ancient orthography is still preserved, but the vowels *η*, *ι*, and *υ*, and the diphthongs *αι*, *οι*, *υι*, are all pronounced like *ee* in English *seen*; *β* is now pronounced as *v*, and the sound of *b* is expressed by *μπ*; *Δ* is pronounced like *th* in *thus*, and *θ* like *th* in *think*.

Greece, Literature of.—The commencement of extant Greek literature is to be found in the two epic poems attributed to Homer, the *Iliad* and the *Odyssey*, which it is commonly believed took shape on the Ionian coast or its islands somewhere between 950 and 850 B.C., and came thence to Greece proper (but see *Homer*). The former deals directly with the Trojan war, the latter describes the wanderings of Ulysses in returning from it. Another poem, of a humorous character, the *Batrachomyomachia*, or 'Battle of the Frogs and Mice,' one of the first and best of parodies, was also ascribed to Homer, but on altogether insufficient grounds, being of comparatively recent origin. In European Greece there appeared about the middle of the ninth century, at Ascra in Bœotia, the poet Hesiod, who stood at the head of another epic school. Of the sixteen works attributed to him there have come down to us the *Theogony* or *Origin of the Gods*, the *Shield of Heracles* (a fragment of a larger poem of later authorship), and, most important of all, the *Works and Days*, a didactic work on agriculture. The works of Homer and Hesiod constituted in a certain degree the foundation of youthful education among the Greeks. The Homeric and Hesiodic schools begin to meet in the Homeric hymns composed by different hands between 750 and 500 B.C. Next came the period of Elegiac and Iambic poetry (700-480), both Ionian, in which the poet's own feelings and personality became distinctly manifested, the chief names being those of Callinus of Ephesus (flourished about 690 B.C.), Tyrtæus, originally of Attica (675), Archilochus of Paros (670), Simonides of Amorgos (660), Mimnermus of Smyrna (620), Solon of Athens (594), Theognis of Megara (540), Pho-

cylides of Miletus (540), Xenophanes of Colophon (510), Hipponax of Ephesus (540), Simonides of Ceos (480). Greek lyric poetry was inseparably linked with music, the lyric period proper lasting from about 670 to 440 B.C. Two principal schools may be distinguished, the Æolian and the Dorian. To the former belong Alcæus (611-580), Sappho (610), and Anacreon (530), though the works which now bear Anacreon's name are spurious. To the Dorian school belong Alcman of Sparta (660 B.C.), credited with the invention of the strophe and antistrophe, Stesichorus (Tisias) of Himera (620), who added to these the epode, Arion (600), who gave shape to the dithyramb, and Ibycus of Rhegium (540). Simonides of Ceos (480) was even more famous as lyric poet than as elegist, his lyrics marking the commencement of a school of national lyric poetry. His nephew, Bacchylides, was also famous, but the chief was undoubtedly Pindar (522-443). About this time began a new literary development, that of the drama, the earliest names in which are Thespis (536) and Phrynichus (512-476). The performance at first, however, was merely a sort of oratorio or choral entertainment, until Æschylus (525-456) introduced a second actor, and subordinated choral song to dialogue. A third and even a fourth actor was added by Sophocles (495-405 B.C.), who supplemented the heroic tragedy of Æschylus with the tragedy of human character and the fundamental passions. Euripides (480-406) brought new qualities of picturesqueness, homeliness, and pathos with a less rigid artistic method, and formed a fitting third in the great tragic triad. With this rapid growth of tragedy there was a corresponding development of comedy which assumed an artistic form about 470 B.C. The names of Cratinus (448) and Eupolis (430) are overshadowed by that of Aristophanes (448-385), who for nearly forty years was the burlesque commentator upon the life of the period. Aristophanes may be regarded as closing the period of the old comedy; the middle comedy of from 390 to 320 (Antiphanes, Alexis, and others) was transitional from the great political comedy to the new comedy of manners, which was vigorous from 320 to 250 in the hands of Menander, Philemon, and Diphilus.

In the meantime a prose literature had arisen, commencing with the group of early Ionian writers (550-450), of which Pherecydes of Syros, Anaximenes, and Anaximander, philosophers, and the logographer or compiler Hecatæus of Miletus were chief. Hellanicus of Mitylene (450) was one of the earliest critical historians, but Herodotus (484-428) was the first writer of great historic rank, as he was also the first great prose stylist. Thucydides (471-400?) was the founder of philosophic history, and Xenophon (431-354), who has left excellent historic narratives, was also the earliest Greek essayist. The oldest piece of Attic prose is the essay on Athenian polity wrongly assigned to Xenophon. Other writers in history were Ctesias (415-398), Philistus (368), Theopompus (352), and Ephorus (340). From 360 onwards Attic history and archæology were preserved in works by various writers, of whom Philochorus (306-260) was chief. The study which oratory and rhetoric received in Athens was an important factor in shaping Attic prose, the chief orators being Antiphon (480-411), Andocides (415-390), Lysias (403-381), Isocrates (436-338), Isæus (390-353), and above all, Demosthenes (384-322) with his contemporaries, Æschines, Lycurgus, and others, and Demetrius of Phalerum (318) who ushered in the decline of oratory. Philosophy shared the development of history and oratory, reaching a rare elevation in Plato (429-347), a rare comprehensiveness in Aristotle (384-322), the founders of the academic and peripatetic schools. Minor Socratic schools were the Cyrenaic, founded by Aristippus (370), the Megaric, founded by Euclid (399), and the Cynic, founded by Antisthenes. In the earlier part of the third century the rival schools of Epicurus (342-270) and of Zeno (344-260) became prominent.

From about the year 300 B.C. the literary decadence may be held to date; the period 300 to 146 being known as the Alexandrian. It comprises the learned poetry of Callimachus (who flourished at Alexandria (250 B.C.) and of Lycophron (260), the epic of Apollonius Rhodius (194), the didactic poetry of Aratus (270), and Nicander (150), the pastoral poetry of Theocritus, Bion, and Moschus, the satirical Silloi of Timon (280), the philology and criticism of Zenodotus (280), Aristophanes of Byzantium (200), Aristarchus (156), and Apollodorus (140), the version of the Septuagint, and the scientific works of Eucleides (300), Archimedes and Eratosthenes (240). From 146 B.C. dates the Græco-Roman period in Greek literature, to which belong the historians Polybius (145 B.C.), Diodorus Siculus (40 B.C.), Dionysius of Halicarnassus (25 B.C.), Josephus, Arrian (100 A.D.), Appian (140 A.D.), and Herodian (240 A.D.), the biographies of Plutarch (90

A.D)., of Diogenes Laertius and of Flavius Philostratus (235 A.D.), the geographies of Strabo (18 A.D.), and of Pausanias (160 A.D.), the astronomy and geography of Ptolemy, the informatory works of Athenæus (190), Ælian (220), and Stobæus (480), the rhetorical and belles-lettristic works of Hermogenes (170), Apthonius and Cassius Longinus (260), the medical works of Galen (160), the satirical works of Lucian (160) and of Julian (331-363), the development of the Greek romance, best represented in Heliodorus (390), Achilles Tatius, and Charitos, etc. During this period philosophy is in the main divided between Stoicism and Neoplatonism, the former represented by Epictetus (90 A.D.) and Marcus Aurelius (170), the latter by Plotinus (240), Porphyry, and Iamblichus. The school of Athens had for chief exponent the eclectic Proclus (450). In verse the best names were the fabulist Babrius (40), Oppian (180), Nonnus, Quintus Smyrnæus (400-450), and Musæus (500). The special feature of the later Græco-Roman period was the rise of a Christian Greek literature represented by the patristic epistles, homilies, etc., and ecclesiastical histories, such as those of Eusebius, Socrates, and Sozomen. Among the chief writers were Justin Martyr, Origen, and Clement of Alexandria, Eusebius, Gregory of Nazianzus, Basil, Gregory of Nyssa, Chrysostom, etc. After 529 and until 1453 came the Byzantine period, of which the most important section was from about 850 to 1200. It was characterized by such writers as Eustathius, Photius, and Suidas, mainly occupied in the attempt to reduce to system a large ill-ordered and aimless erudition.

On the fall of Constantinople in 1453 the cultivated classes who still retained the pure Greek either perished or took to flight, or adopted the language of the conquerors. The popular Greek, however, survived, and despite its vulgarization and the modification of its grammatical forms and syntax, it cannot be said that Greek has been a dead language at any period since Homer. By some modern Greek literature is dated from Theodore Prodromos (1143-80), a monk and writer of popular verse, but the only names of importance until the close of the eighteenth century are those of Maximus Margunius (1530-87), Anacreontic poet and letter writer, Leo Allatius (1586-1669), Sciote, scholar and poet, George Chortakes (seventeenth century), Cretan poet, Franciscus Scuphos, Cretan writer on rhetoric (1681), Elias Meniates (1669-1714), a Cephalonian ecclesiastic, Vincentius Kornaros, Cretan poet, author of *Erotocritos* (1756), Kosmas, the Ætolian (1714-79), preacher and founder of schools, Rhegas Pherraios (latter half of eighteenth century), patriotic poet, Eugenios Bulgaris (1716-1806), writer of scientific and religious works, and Nicephorus Theotokes (1738-1800), writer on metaphysics and theology. At this period the patriotic movement found one outlet in the purification of the language and the development of a new literary impulse. The most important figure was that of Adamantros Koraes, or Coray, (1748-1833), who did more than all his predecessors to found a literature. Anthimos Gazes (1764-1837) and Athanasius Christopulos (1772-1847) were eminent as grammarians and lexicographers, the latter also as a lyric poet. Neophytus Bambas (1770-1855), miscellaneous educational writer, Constantine Æconomos (1780-1857), theological writer, Theoclytus Pharmakides (1784-1862), ecclesiastic and journalist, Spiridion Zampelios, literary antiquary, and Trikoupis, orator of the struggle for independence, were also prominent. The poetry of the people is represented chiefly in the songs of the Klephts and other songs dating from the war of independence. At this period the war-songs of Rhigas were sung by the whole nation, and at a later period the two Soutzos, Panagios and Alexander, Calvos, Solomos, and others, earned distinction in the same kind of poetry. The Soutzos were further distinguished as satirists, and Alexander ranks also with the dramatists Rhisos Neroulos and Zampelios. Among the most gifted of recent writers is Rhisos Rangabé, distinguished in lyric, dramatic, and epic poetry, also as a novelist and a scholar.

Greece, Art of.—As in literature so in art the Greeks attained the highest pitch of excellence, and in architecture and sculpture furnished models for the rest of the world. In no other race has the artistic spirit been so generally diffused throughout the people, expressing itself in the minor arts of life, in the practical application of ornament in the forms of domestic furniture, pottery, metal work, mosaics, and the like, not less perfectly than in the master-works of architecture and sculpture.

The earliest architectural remains in Greece are pre-Hellenic in origin and Asiatic in character, Greek architecture proper dating from about the close of the eighth century B. C. The earliest known example—the Doric temple at Corinth—belongs to about the middle of the seventh century B. C., and points to

an Egyptian origin, the style being remotely derived from the so-called 'proto-Doric' temple of Beni Hassan in Lower Egypt. Throughout the history of the art it is the public buildings, more particularly the temples, in which the genius of the Greeks displayed itself. The private houses remained simple and even rude in appearance, rarely rising above a single story, and having no external decoration. The temples were for the most part rectangular, though the circular form sometimes occurs in the later periods of Greek art. In the simplest form of the rectangular temple (the *apteral*) there were no columns; but, by an easy development from this, the side walls were carried out beyond those constituting the ends of the building, so as to form a porch. The extended walls terminated in pilasters (*antæ*) between which, in the front line of the porch, two columns were placed. As a further development, four additional columns were placed in advance of the line connecting the *antæ*, sometimes in front only (prostyle), sometimes at both ends (amphiprostyle). More complex forms were known as *peripteral*, where the columns were carried completely round the building; as *dipteral*, where a double range of columns surrounded it; and as *pseudo-dipteral*, where a double range of columns was placed in front and rear, but only a single range at the sides. The dipteral and pseudo-dipteral styles were seldom employed, the chief example of the dipteral having been the temple of Diana at Ephesus, built by Ctesiphon in the sixth century B. C. Most of the famous temples in Greece were, however, peripteral. Three orders are distinguished in Greek architecture according to the treatment of the pillars and of the entablature—the Doric, Ionic, and Corinthian (which see). Of these the Doric is the most ancient, the most important examples in Greece, besides that already mentioned, being the temple at Ægina (middle of the sixth century B. C.), the temple of Theseus at Athens, and the Parthenon, constructed about 448 B.C. by the architects Ictinus and Callicrates, and adorned with unsurpassed sculpture by Phidias and his pupils. Next to these came the temple of Zeus at Olympia, the temple of Apollo at Bassæ, the frieze of which is in the British Museum, the temple of Minerva at Sunium, the great temple at Rhamnus, and those at Selinus in Sicily (middle of seventh century), Agrigentum, Segesta, and Pæstum. The oldest Ionic temple in Greece was probably the temple of Ilissus (about 488 B. C.), but the oldest of which remains are still visible is that dedicated to Juno at Samos, and there are remains of a fine temple of this order at Teos. The most perfect example, however, is the Erechtheum at Athens. The Corinthian order, though Grecian in its origin, is represented amongst the Greek temples by a single example only, that of the Zeus Olympius at Athens; and even this temple belongs to the Roman period. The Choragic monument of Lysicrates at Athens also belongs to this order. The beauty of the Greek buildings was heightened in respect of form by a deviation from ordinary rectilinear construction, in the systematic substitution of delicately-curved lines for straight lines in the columns and steps of their temples, and wherever the illusion attending the sight of straight lines in

Temple of Zeus at Olympia—Doric order.

The Erechtheum at Athens—Ionic order.

perspective was likely to prove an element of weakness. Color and gilding also played an important part in the total effect, the old tufa temples being colored throughout, and even in the marble temples, though it is doubtful if the marble columns were ever colored, the mouldings of cornices and ceilings, the capitals of the antæ, the mouldings of the pediment and the triglyphs were all decorated with color. The colonnades and porticoes, which were usually built round market-places and along quays in seaport towns, were similar in style to the temples. See also *Architecture*.

Greek *sculpture* has been divided into five principal periods, namely: 1. The Dædalian or Early (-580 B.C.). 2. The Æginetan or Archaic (580-480 B.C.). 3. The Phidian or Grand (480-400 B.C.). 4. The Praxitelean or Beautiful (400-250 B.C.). 5. The Decline (250 B.C. onwards). The age of Dædalus marks an advance from an earlier primitive sculpture in which blocks of wood and stone were rudely fashioned into the semblance of life, the imperfections of the art being concealed by real hair and adventitious draperies. During the Dædalian period the treatment was highly conventionalized, a single type serving for a variety of divinities and heroes, the hair being often entirely curled and gathered into a club behind, and the dresses of the female divinities being divided into a few perpendicular folds. Many of these characteristics survived in the Æginetan period, but a higher knowledge of anatomy and greater freedom and boldness of treatment are apparent. The sculptures of the Theseum form a connecting link between the Æginetan school and that of Phidias. To Phidias, besides his statues of Athena and Zeus, were due the designs for the sculptures of the Parthenon, the actual work of these, however, being probably done by his pupils Alcamenes, Agoracritus, and other artists of his time. To this age belonged the sculptor and architect Polycletus (about 452-412 B.C.), whose statue of a youth holding a spear obtained the name of The Canon, as being a standard of form. About the same time the Bœotian sculptor Myron flourished, the famous Discobolus being a reproduction in marble of one of his bronzes. The Praxitelean period is characterized by greater grace and elegance in choice of subject and treatment, together with more of the sensual element making for ultimate decline. Praxiteles excelled in female figures, his Aphrodite at Cnidus in Caria being his most famous work. His rival, Scopas of Paros, was employed on the bas-reliefs of the Mausoleum at Halicarnassus, and was the sculptor of the famous group representing the destruction of the children of Niobe. In Lysippus of Sicyon, in the time of Alexander the Great, the Praxitelean school found its last great figure prior to the decline of the art.

Painting in Greece is said to have had its origin in Sicyon, and to have existed as mere outline and monochrome until Cimon of Cleonæ introduced variety in coloring, foreshortening, and a less rigid art. The Greek artists worked in wax or resin or in water-color, brought to the required consistency by mixing with gum, glue or white of egg; and they painted upon wood, clay, plaster, stone, parchment, and canvas. Until a late period, however, they rarely painted upon walls, usually painting upon panels or tablets to be encased in walls. The earlier masters appear to have used only four colors—red, yellow, white, and black, but by the time of Apelles and Protogenes many other pigments were in use. The earliest painters of renown were Micon of Athens (about 460 B.C.), and Polygnotus of Thasos and of Athens (about 463-430 B.C.); but a higher degree of illusion and realism appears to have been reached under Zeuxis and his rival Parrhasius, towards the close of the fifth century B. C. A greater name than any of these is that of Apelles, the friend of Alexander the Great, contemporaneously with whom flourished Protogenes of Caria, painter and statuary, and Nicias of Athens, a distinguished encaustic painter. Of the work of these artists only a general conception can be formed from the mosaics and frescoes of Pompeii.

Greek Church, or Holy Oriental Orthodox Apostolic Church, that section of the Christian church dominant in Eastern Europe and Western Asia, especially in Turkey, Greece, Russia, and some parts of Austria. In the first ages of Christianity numerous churches were founded by the apostles and their successors in Greek-speaking countries; in Greece itself, in Syria, Egypt, Mesopotamia, Asia Minor, Thrace, and Macedonia. These were subsequently called Greek, in contradistinction to the churches in which the Latin tongue prevailed. The removal of the seat of empire by Constantine to Constantinople, and the subsequent separation of the eastern and western empires afforded the opportunity for diversities of language, modes of thinking, and customs to manifest themselves, and added political causes to the grounds of separa-

tion. During the earliest period the chief seats of influence in the Eastern Church were Jerusalem, Antioch, and Alexandria, the seat of that mystical philosophy, by which the oriental church was distinguished. In 341, soon after the synod of Antioch, the rivalry between the Bishop of Rome and the Bishop of Constantinople began to assume importance, and before 400 differences of doctrine with respect to the procession of the Holy Spirit appeared. The council of Chalcedon in 451 accorded to the eastern bishop the same honors and privileges in his own diocese as those of the Bishop of Rome, and in 484 each bishop excommunicated the other. The title of *Œcumenical Patriarch* was assumed by John, Bishop of Constantinople, in 588, and in the following year the phrase 'Filioque' ('and the Son') was added by the Latins to the Nicene creed (which now reads 'proceeding from the father and the son'), an addition to which the Greek Church was opposed. In 648 Pope Theodore deposed Patriarch Paul II; but a reconciliation of the churches was effected at the Council of Rome (680). The doctrines of the Greek Church were defined by John Damascenus in 730. The disruption was hastened by the banishment of Ignatius by Michael the Drunken and the consecration of Photius (858). The Pope Nicholas I and Photius excommunicated each other in 867. The schism was temporarily healed after the death of Photius, but Michael Cerularius reopened it by charging the Latins with heterodoxy. He was excommunicated by Leo IX in 1054, and in turn excommunicated the pope in the same year, since which the Greeks have been severed from the Roman communion, though the Russo-Greek Church was not separated until the twelfth century. The presence of the Crusaders in the East aggravated the quarrel; Latin patriarchates were established in Antioch and Jerusalem, and, though on the capture of Constantinople by the Crusaders a Latin patriarchate was set up there (1204), the schism was revived there as soon as the Latin empire fell (1262). Reunion was proposed in 1278 by Patriarch Joseph, and effected, with the acknowledgment of the pope as primate, at the council of Lyons (1274). The union, however, was annulled in 1282 by Emperor Andronicus II, and in 1283 and 1285 by synods of Constantinople. It was again effected under John Palæologus at Florence in 1439, but was repudiated in 1443 by the Patriarchs of Alexandria, Antioch, and Jerusalem. In 1453, when the patriarch fled from the Turks, a schismatic Gregory Scholarius was chosen in his place. In 1575 unsuccessful negotiations were commenced with a view to union with the Lutherans, and in 1723 the English bishops even proposed that the Greek and Anglican churches should unite, a proposal revived by the Archbishop of Moscow in 1866. The claims of the czar in 1853 to the protectorate of the Greek churches in Turkey was one of the causes of the Crimean war.

The Greek Church is the only church which holds that the Holy Ghost proceeds from the Father only; the Catholic and Protestant churches deriving the Holy Ghost from the Father and the Son. Like the Roman Church, it has seven sacraments—baptism; chrism; the eucharist, preceded by confession; penance; ordination; marriage; and extreme unction. But it is peculiar—1, in believing in baptism by immersion, the chrism (confirmation) being united with it; 2, in adopting, as to the eucharist, the doctrine of transubstantiation, as well as the Roman views of the host; but in ordering the bread to be leavened, the wine to be mixed with water, and both elements to be distributed to every one, even to children, the communicant receiving the bread broken in a spoon filled with the consecrated wine; 3, the clergy are permitted to marry, but only once and to a virgin; widowed clergy are not permitted to retain their livings, but go into a cloister, where they are called *hieromonachi*. Rarely is a widowed bishop allowed to preserve his diocese. The Greek Church grants divorces, but does not allow the laity a fourth marriage. It differs from the Roman Church in anointing with the holy oil, not only the dying but the sick, for the restoration of health, forgiveness, and sanctification. It rejects the doctrine of purgatory, works of supererogation, indulgences, and dispensations, but admits prayers for the dead, whose condition appears to be considered undetermined until the final judgment. It recognises no visible vicar of Christ on earth, but the spiritual authority of patriarch is little inferior to that of the pope. It allows no carved, sculptured, or molten image of holy persons or subjects; but the representations of Christ, of Mary, and the saints, must be merely painted, and at most inlaid with precious stones. In the Russian churches, however, works of sculpture are found on the altars. In the invocation of the saints, and especially of the Virgin, the Greeks are as zealous as the Romans. They also hold relics, graves, and crosses sacred; and crossing in the name of Jesus they con-

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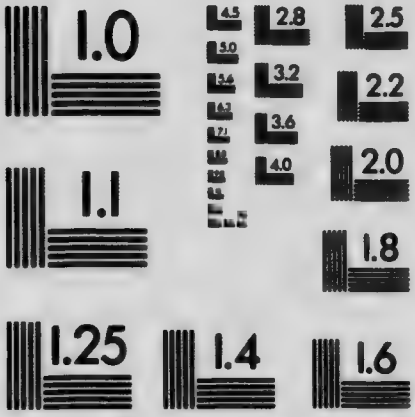

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sider as having a wonderful and blessed influence. Among the means of penance, fasts are particularly numerous with them. They fast Wednesday and Friday of every week, and besides observe four great annual fasts, namely, forty days before Easter; from Whitsuntide to the days of St. Peter and Paul; the fast of the virgin Mary, from the 1st to the 15th of August; and the apostle Philip's fast, from the 15th to the 26th of November; besides the day of the beheading of John the Baptist, and of the elevation of the cross. The calendar of the Greek Church is in the old style, their new year's day falling on Jan. 13th.

The services of the Greek Church consist almost entirely in outward forms. Preaching and catechizing constitute the least part of it. Instrumental music is excluded altogether. The mass is considered of the first importance. The convents conform, for the most part, to the strict rule of St. Basil. The Greek abbot is termed *higumenos*, the abbess *higumenē*. The abbot of a Greek convent which has several others under its inspection is termed *archimandrite*, and ranks next a bishop. The lower clergy in the Greek Church consist of readers, singers, deacons, etc., and of priests or popes and protopopes or archpriests, who are the first clergy in the cathedrals and metropolitan churches. The members of the lower clergy can rise no higher than protopopes, for the bishops are chosen from among the monks, and from the bishops are selected the archbishops, metropolitans, and patriarchs. In Russia there are twenty-four dioceses. With which of them the archiepiscopal dignity shall be united depends on the will of the emperor. The seats of the four metropolitans of the Russian Empire are St. Petersburg, Kiev, Kasan, and Tobolsk. In the Turkish dominions the dignities of Patriarch of Constantinople, Alexandria, Antioch, and Jerusalem still subsist. The Patriarch of Constantinople still possesses the ancient authority of his see; the other three patriarchs exercise a very limited jurisdiction, and live for the most part on the aid afforded them by the Patriarch of Constantinople.

Greek Fire, an inflammable and destructive compound used in mediæval warfare, especially by the Byzantine Greeks. It was poured from cauldrons and ladles, vomited through long copper tubes, or flung in pots, phials, and barrels. The art of compounding it was concealed at Constantinople with the greatest care, but it appears that naphtha, sulphur, and niter entered into its composition.

Greek Language, Literature, Art, etc. See under *Greece*.

Greeley, a city, capital of Weld County, Colorado, on the Cache la Poudre River, 52 miles N. of Denver. It is the center of the sugar-beet industry and in a rich, irrigated district. Pop. 10,000.

Greeley (grē'lē), HORACE, journalist, was born at Amherst, New Hampshire, in 1811, the son of a poor farmer, and learned the art of printing in Vermont. In 1831 he went to New York, where, after an unsuccessful attempt to start the *Morning Post*, the first penny paper, he commenced in 1834 to issue the *Weekly New Yorker*, which ran for seven years. The *Log Cabin*, another weekly, established by him in 1840, reached a circulation of 80,000, and gave him a reputation which ensured the success of his *Daily Tribune*, founded in 1841, and edited by him till his death. In his conduct of it he won high reputation as an editor of marked ability. In 1848 he was elected to Congress, but failed to impress his constituents with the necessity of returning him a second time. In 1851 he visited Europe, and was one of the jurors in the London World's Fair. He opposed the Civil war, but was a firm supporter of the Union and of President Lincoln, and at the close of the war advocated a general amnesty and universal suffrage. In 1872 he was nominated for the presidency in opposition to General Grant, but was defeated. The strain of electioneering and the death of his wife brought on an illness of which he died a few weeks later. Among his works are his *Hints towards Reforms* (1850), *Glances at Europe* (1851), *History of the Struggle for Slavery Extension* (1856), *The American Conflict* (1864), and *Recollections of a Busy Life* (1869).

Greely, ADOLPHUS W., explorer, was born at Newburyport, Massachusetts, in 1844. He served in the Civil war, gaining the rank of captain and receiving severe wounds. In 1867 he entered the regular army as lieutenant, was placed in the signal service in 1868, and in 1881 was placed in command of the Lady Franklin Bay expedition to the Arctic region. After extreme hardships, in which some of the expedition died of starvation, he and his command were rescued in 1884, when the whole of them were at the point of death. In 1887 he was made chief of the signal service, with the rank of brigadier-general. He published *Three Years of Arctic Service*, *American Weather*, etc.

Green, Mrs. Hetty Howland Robinson, Mrs. Hetty Green, generally believed to have been the world's richest woman, died in New York City, July 2, 1916, in her eighty-second year. She left the bulk of her estate, estimated at $100,000,000, to her son, Col. E. H. R. Green, and her daughter, Mrs. Matthew Astor Wilkes, in trust for ten years.

Green, John Richard, historian, born at Oxford, England, in 1837; ordained curate in 1860, subsequently vicar of St. Philips, Stepney, and librarian to the Archbishop of Canterbury at Lambeth. For some time he wrote constantly for the *Saturday Review;* but he was comparatively little known until the publication in 1874 of his *Short History of the English People,* which secured him immediate fame. It was followed by a larger edition of the same work entitled *A History of the English People* (1877–80), a volume of *Stray Studies from England and Italy,* and by the *Making of England* (1882). In his later years his work was carried on in distressing conflict with lung disease, and he died in 1883. The *Conquest of England,* his last work, was published posthumously by his wife, it having been almost completed by him prior to his death.

Green, Seth, fish-culturist, born at Rochester New York, in 1817; died in 1888. He gained an intimate knowledge of fish and their habits, invented methods for their preservation and propagation, and was in a sense the father of modern pisciculture. Was made superintendent of the fish commission of New York in 1868, and wrote several works on the subject of fish hatching and culture.

Green, Thomas Hill, an English philosophical writer, born in 1838; fellow of Balliol College in 1862, and first lay tutor on that foundation in 1867. In 1877 he was appointed Whyte's professor of moral philosophy; but his work was abruptly closed by his death in 1882. Apart from his *Prolegomena to Ethics,* published posthumously in 1883, the bulk of his work was in the form of articles contributed to the *North British* and *Contemporary Reviews.* He was one of the strongest opponents of the English empirical school.

Greenbacks (grēn'baks), the popular name given to the paper currency first issued by the United States government in 1862 during the Civil war, the name being an illusion to its color. It is sometimes used also to include United States bank-notes. It gave name in 1876 to a political party, known as the Greenback Party, which advocated an unlimited issue of government paper currency.

Green Bay, a city and lake port, capital of Brown County, Wisconsin, at the head of Green Bay, Lake Michigan, at the mouth of Fox River. It has a large trade in lumber, extensive sawmills, cooperage works, and breweries, and other flourishing industries. Pop. 25,236.

Green-brier, a popular name in the United States for a very common thorny climbing shrub, *Smilax rotundifolia,* having a yellowish-green stem and thick leaves, with small bunches of flowers.

Green-dragon, a North American herbaceous plant, the *Arisæma Dricontium,* one of the arum family, called also wake-robin. For another green-dragon, see *Dracunculus.*

Green Mountain Boys, a name applied to the Vermont militia in the American Revolution, when led by Ethan Allen to the taking of Fort Ticonderoga, and subsequently it was also given to Vermont regiments in the Civil war. The name was taken from the principal range of mountains in the state.

Greene, Nathaniel, a general of the American revolutionary army, born at Potowhommet, Rhode Island, in 1742. In 1770 he was elected to represent Coventry in the general assembly of Rhode Island, and was soon after excommunicated by the Quakers for taking arms on the prospect of war with Britain. In 1774 he joined the Kentish Guards as a private, and in May, 1775, he was appointed brigadier-general and commander of the Rhode Island contingent in the army before Boston. He gained at once the confidence of Washington, was made major-general, and appointed to the command in New Jersey. At Trenton (1776) and Princeton (1777) he led a division, and in the subsequent fighting he held important commands, and repeatedly distinguished himself. In 1778 he was quartermaster-general, and in 1780 presided at the trial of Major André. In the same year he was appointed to the command of the southern army. In this command he showed the highest ability, worsted Cornwallis with very inferior forces, and succeeded in wresting Georgia and the Carolinas from the British. He is looked upon as ranking next to Washington in military ability in the revolutionary army. He died in 1786.

Greene, Robert, a British dramatist, born about 1560; studied at Cambridge, and took his degree of B.A. in 1578, after which he traveled on the continent. He was graduated M.A. in 1583, lived a wild and profligate life, and died in poverty in 1592. His works consist of plays, poems, tales, and tracts. His romances include *Pandosto* (1588), *The History of Arbasto* (1617), *A Pair of Turtle Doves* (1606), and *Menaphon* (1587). His plays comprise *The Honourable Historie of Friar Bacon and Friar Bungay* (1594), *Orlando Furioso* (1594), *Alphonsus, King of Aragon* (1597), and *James IV* (1598). In addition he produced many miscellaneous works. His *Groat's Worth of Wit Bought with a Million of Repentance* (1592) is remarkable for the allusion to Shakespere, 'an upstart crow, beautified with our feathers.' His *Pandosto* furnished the basis for Shakespere's *Winter's Tale.*

Green Earth, an opaque, dull, olive-green, soft, earthy mass, generally met with in cavities in amygdaloidal rocks. It consists of silicate of iron and aluminum, with potassium and sodium in water.

Green-ebony, an olive-green wood obtained from the South American tree *Jacaranda ovalifolia*, nat. order Bignoniaceæ, used for round rulers, turnery, marquetry work, etc., and also much used for dyeing.

Greenfield (grēn'fēld), a county seat of Franklin county, Massachusetts, on the Connecticut River, 36 miles N. of Springfield. It has cutlery, edge-tools, silverware, and other manufacturing industries; it is an automobile center, and a favorite summer resort. Pop. 10,427.

Greenfinch, Green-linnett, or Green Grosbeak (*Coccothraustes chloris*), a bird of the finch family, and one of the most common of European birds. It frequents hedges, gardens, and small plantations, and feeds on grain, seeds, or insects. Its song is not melodious.

Green Gage (grēn gāj), a variety of the plum, the *reine claude* of the French, introduced into Britain by a person named Gage. It is large, of a green or yellowish color, and has a juicy, greenish pulp of exquisite flavor. It is well known in the United States.

Greenheart (grēn'hart; *Nectandra Rodiæi*), a tree of the nat. order Lauraceæ, a native of Guiana, called also the *bebeeru*. Its wood is hard and durable, and is used in shipbuilding, not being liable to attacks from the Teredo. The bark contains the alkaloid bebeerine.

Greenhouse, a building constructed chiefly of glass for the preservation of delicate plants. A greenhouse is sometimes distinguished from a hothouse by not requiring artificial heat during summer, and from a conservatory in having the plants in pots and not in the ground. The lean-to form, in which advantage is taken of a house or garden wall as a support, is frequently used, but the growth of plants in such houses is one-sided, and the span or arch-roofed structures, with glass on all sides, are to be preferred. The materials used are chiefly glass, wood, and iron.

Greenland (grēn'land; Danish and German, *Grönland*), an extensive island belonging to Denmark, situated on the northeast of the continent of N. America, from which it is separated by Davis Straits, Baffin Bay, and Smith Sound. It extends from 59° 45′ to about 83° N. lat., and has an area of about 850,000 square miles. Like the northern parts of N. America generally, Greenland is colder than the corresponding latitudes on the east side of the Atlantic. In June and July the sun is constantly above the horizon, the ice on the coast is broken up and floats southward, and a few small lakes are opened; but the short summer is followed by a long and dreary winter. The interior, which is lofty and has the appearance of one vast glacier, is uninhabitable, and all the villages are confined to the coasts, which are lined with numerous islands, and deeply penetrated by fiords. The Danish colony extends north, on the western coast, to the Bay of Disco, in lat. 69° N. Cultivation is confined to the low shores and valleys, where grassy meadows sometimes occur with stunted shrubs and dwarfed birch, alder, and pine trees. Attempts to raise oats and barley have failed, but potatoes have been grown towards the southern extremity. Turnips attain the size of a pigeon's egg, and cabbages are very small. The radish is the only vegetable which grows unchecked. The inhabitants are largely dependent upon hunting and fishing. Whale blubber and seal oil are used as fuel. Despite the proximity of America the flora and fauna are rather of an European character. The land animals are the Esquimo dog, the reindeer, the polar bear, the Arctic fox (blue and white), the ermine, the Arctic hare, and the musk ox. Among the amphibia the walrus and several species of seal are common. The seas abound in fish, the whale and cod fisheries

being of special importance. Sea-fowl are abundant in summer, and largely killed. The chief mineral product is cryolite, but graphite and miocene lignitic coal are also found. Oil, eider down, furs, and cryolite are exported. The population, which is chiefly Eskimo, numbers about 12,000, not more than 300 being Europeans. For administrative purposes Greenland, or rather its coast, is divided into two inspectorates of North and South Greenland. The residences of the inspectors are at Disco Island and Godhaab, but the most populous district is Julianshaab.

Greenland was discovered by an Icelander named Gunnbjörn about 876 or 877. It was colonized from Iceland about the end of the tenth century and other Scandinavians followed. In 1264 it was politically united with Norway, and about the middle of the fourteenth century possessed two flourishing colonies on the west coast, named West Bygd and East Bygd. These settlements, however, gradually disappeared from history, and the expeditions sent by Denmark in 1585, 1606, 1636, 1654, and 1670 for the purpose of finding the colony were unsuccessful. Various relics, inscriptions, etc., have been found. In the reign of Elizabeth Captains Frobisher and Davis rediscovered the coast, but nothing was done to explore it until the Danish government in 1721 assisted Hans Egede, a clergyman, to establish a European mission settlement, Good Hope (*Godhaab*). Whale-fisheries were established on the coast by the English and Dutch about 1590. The interior of the country was first crossed from east to west by Nansen in 1888. Peary in 1886 penetrated the ice-cap for 100 miles, lat. 69° 30′ N. He made other trips between 1891 and 1902, traced the northern coast, and discovered some outlying islands. In 1900 Amdrup completed the survey of the southeast coast; in 1906-08 the Danish Northeast Greenland Expedition under Erichsen made detailed exploration of the east coast. The country was found to be uninhabited, but there was signs of former settlements.

Green Mountains, a mountain range of New England, commencing near New Haven, Connecticut, and extending north through Massachusetts and Vermont, between Lake Champlain and the Connecticut River. Mount Mansfield, the highest peak, is 4406 feet high. The range is a northern extension of the Appalachians.

Greenock (grēn'uk) a parliamentary burgh and seaport town of Scotland, County Renfrew, about 20 miles west by north of Glasgow. The principal public buildings are the custom-house, the Watt monument, containing the Greenock library, and the Watt Museum and Lecture Hall. There are large industries, including sugar refineries, ship-building yards, and various others. Greenock carries on a considerable coasting and foreign shipping trade, especially with East and West Indies, America, and Australia. Large numbers of vessels unload at Greenock and ascend to Glasgow for cargoes. Pop. 68,142.

Greenough (grēn'ō), HORATIO, a noted sculptor, born at Boston, Massachusetts, in 1805; died in 1852. He was graduated at Harvard in 1825, but before this date went to Rome to study art, and after 1826 resided in Italy, principally at Florence, until 1851. An early work was the design from which Bunker Hill monument was constructed. His *Chanting Cherubs* was the first group in marble ever executed by an American sculptor. His *Venus Contending for the Golden Apple* won great admiration at Florence. Among the most important of his works is the colossal *Washington*, ordered by the United States government, and placed in front of the national capitol. A volume of *Essays*, by him, was published in 1853.—RICHARD S. GREENOUGH, his brother (1819-1904), was also a sculptor of much ability and of a poetic and refined style, but he failed to reach the eminence of the elder Greenough.

Green Paints, are for the most part compounds of copper and of chromium. The best known greens are the following:—*Bremen* green, or verditer, consisting mainly of a basic carbonate of copper. *Brunswick* green, a hydrated oxychloride of copper; but the name is sometimes given to a hydrated basic carbonate, also known as *mountain* green. *Chrome* and *emerald* green are oxide of chromium. *Emerald* green (which see) is also used as synonymous with *Schweinfurt* green. *English* green is a mixture of Scheele's green with gypsum. *Guignet's* green is oxide of chromium prepared in a peculiar way. *Hungary* green is a kind of malachite found in Hungary. *Rinman's* green is got by heating zinc oxide with a cobalt compound. *Saxony* green is an indigo color used in printing. *Scheele's* green is arsenite of copper, and *Schweinfurt* green, *Veronese* green, and *Vienna* green, are also compounds of arsenic and copper. *Verdigris* is a hydrated basic carbonate of copper, often seen in copper saucepans. Besides these are green colors derived from plants. Of these may be mentioned *chlorophyll*, the green color of leaves;

sap green, the juice of *Rhamnus cathartica* or buckthorn, made into a green lake with alumina; *Chinese indigo-green*, etc.

Green River, Kentucky, flows generally west and northwest, and enters the Ohio 200 miles below Louisville. It is navigable for boats for about 200 miles.

Green River, Wyoming, rises in W. Wyoming, flows S. E. into Colorado, and then S. W. and S. through Utah, joining the Grand River, a branch of the Colorado, after a course of 750 m. Its drainage area is 47,220 sq. m.

Greensand, a name common to two groups of strata, occurring in the southeast of England, the Isle of Wight, etc., the one (lower greensand) belonging to the lower cretaceous series, the other (upper greensand) to the upper cretaceous series; between them is the clay called the gault. They consist chiefly of sands, with clays, limestones, and chert bands. They were named on account of the green color, due to silicate of iron, which some of the beds show, though some tertiary sands are as green. In the United States similar strata exist, known as *marl*, and used for fertilizing purposes. Marl occurs abundantly in New Jersey, Virginia, and North Carolina.

Greensboro, a city, county seat of Guilford County, North Carolina, on the main line of the Southern Railroad. Here is the State Normal College, Greensboro College for Women, the Agricultural and Mechanical College (colored), etc. The principal industry is cotton goods; other products are furniture, cigars, tobacco, fertilizer, electric fixtures, etc. Pop. 19,246.

Greensburg, a city, county seat of Decatur County, Indiana, 47 miles S. E. of Indianapolis. It has large stone quarries, and manufactures of carriages, chairs, spokes, flour, etc. Pop. 5420.

Greensburg, borough, county seat of Westmoreland County, Pennsylvania, 31 miles E. of Pittsburgh on the main line of the Pennsylvania Railroad. It is in a great coal and gas region, and manufactures flour, engines, glass, nuts and bolts, etc. It contains the barracks of Troop A, Pennsylvania State Police. Pop. 13,012.

Greenshank, a European sand-piper (*Totanus canescens*), often called the whistling snipe from the shrill note it utters when first flushed.

Green-tea, a tea of a greenish color. The green color is due to the mode in which the leaves of the tea-plant are treated in the process of drying.

Greenville, a city, capital of Washington County, Mississippi, 100 miles N. N. W. of Jackson. It has cottonseed-oil and lumber mills, etc., and a large trade in cotton. Pop. 9,610.

Greenville, a city, capital of Darke County, Ohio, 35 miles N. W. of Dayton. It has foundry and machine shops, etc., and is in a tobacco-growing region. Pop. 6257.

Greenville, a city of Mercer County, Pennsylvania, on three railroads. It has steel plant, railroad shops, foundries, etc., and is the seat of Thiel College (Lutheran). Pop. 5909.

Greenville, a city, county seat of Greenville County, South Carolina, on the Reedy River, on the main line of the Southern Railway, 160 miles E. of Atlanta. It has three collegiate institutions, and is an important cotton market and the center of the southern textile industry. Pop. 15,741.

Greenville, a city, county seat of Hunt County, Texas, on the Sabine River, 52 miles N. E. of Dallas. It has cotton industries, refinery, oil mills, brick plants, etc., and is the seat of Burleson (Baptist) College and Peniel (Holiness) University. Pop. 8850.

Greenwich (grĕn'ich), a parliamentary borough of England, County Kent, on the right bank of the Thames, about 5 miles S. E. of London Bridge. It is built partly on an acclivity, but chiefly on the level ground skirting the river. There are extensive iron foundries and engineering works, barge and boat-building yards, boiler works, mast, block, and sail works, telegraph cable works, roperies, chemical factories, etc. The object of greatest interest is the magnificent hospital, the oldest portion of which was originally a palace of Charles II. It was converted to its charitable purpose in the reign of William and Mary. Three additional wings were built from designs by Sir Christopher Wren, who also completed the unfinished pile of Charles II. As an hospital for aged and disabled seamen of the navy, it was opened in 1705, and subsequently accommodated about 3000. In 1865, however, it ceased to be an asylum for seamen, and is now the seat of the Royal Naval College for the education of naval officers. It also contains a naval museum and picture gallery. Adjoining it are the Royal Naval School for boys, and an infirmary for sick and disabled seamen. Greenwich Park, an open, undulating piece of ground, area 180 acres, finely wooded and well stocked with deer, is a

favorite resort of holiday-making Londoners during the summer. The celebrated observatory of Greenwich, erected by Charles II for Flamsteed, stands upon an eminence in the park. The longitude of all British maps and charts, and also of those issued by the government of the United States of America, as well as many of those published in other countries, is computed from this observatory, which is 2° 20′ 28″ W. from the observatory of Paris, and 18° E. from the meridian of Ferro. Greenwich (including Deptford and Woolwich) was erected into a parliamentary borough in 1832. France, which had long refused to accept the Greenwich meridian, did so in 1911, so that now all the principal countries of the world have adopted this as the basic meridian. Pop. (1911) 95,968.

Greenwich, a village of Greenwich township (town), Fairfield County, Connecticut, on Long Island Sound, 30 miles from New York. A favorite suburban resort for New Yorkers, with many handsome residences. The township forms the S. W. extremity of the state and has a population of 10,462.

Greenwood, county seat of Greenwood Co., South Carolina, in the Piedmont section. It has cotton factories, cotton-seed oil mills and other industries. Pop. 6614.

Greenwood, a city, county seat of Leflore County, Mississippi, on the Yazoo River, 98 miles north of Jackson. It is one of the largest cotton markets in the South. Pop. 8000.

Greg, WILLIAM RATHBONE, an English writer, born in 1809; died in 1881; was commissioner of customs in 1856, and controller of the stationery office in 1864. Besides his miscellaneous essays and pamphlets (collected in 1881 and 1882) he was the author of *Sketches in Greece and Turkey* (1833), *The German Eckism and the Irish Priests* (1845), *The Creed of Christendom* (1851), *Essays in Political and Social Science* (1853), *Enigmas of Life* (1872), *Rocks Ahead* (1874), and *Literary and Social Judgments* (1877).

Gregarinidæ (greg-ar-in'i-dē), a class of minute animal organisms, comprising the lowest forms of the Protozoa, found parasitic in various animals, especially the cockroach and earthworm. The Gregarinidæ consist of an outer colorless transparent membrane, with only faint signs of fibrillous structure, inclosing a granular mass, in which there is a nucleus surrounded by a clear space. They are destitute of a mouth, and have not the power of giving out pseudopodia, and hitherto no definite organs have been detected in them.

Grégoire (grā-gwär), HENRI, COUNT, Bishop of Blois, a churchman and statesman of the French revolution, born in 1750. In 1789, while curé of Emberménil, in the district of Nancy, he was sent by the clergy of Lorraine as their representative to the states-general. As one of the secretaries of the constituent assembly he joined the extreme democratic section, and in the convention voted for the condemnation, though not for the death, of the king. Although extreme in his democratic opinions, he was an unflinching Jansenist. He was a member of the Council of Five Hundred, of the corps législatif, and of the senate (1801). On the conclusion of the concordat he resigned his bishopric. He voted against the establishment of the imperial government, and alone in the senate resisted the restoration of titles of nobility. He himself afterwards accepted the title of count, but in the senate was always one of the small body who opposed Napoleon, and in 1814 was one of the first to vote for his deposition. He passed the latter part of his life in retirement, and died at Paris in 1831. He left numerous works, among them *Ruines de Port Royal*, 1801; *Essai Historique sur les Libertés de l'Eglise Gallicane; Histoire des Sectes Religieuses depuis le Commencement de ce Siècle*, 1810 and 1828, and *Annales de la Religion*, 1795-1803.

Gregorian Calendar (gre-gōr'i-an), the calendar as reformed by Pope Gregory XIII in 1582 (see *Calendar*). The *Gregorian year* is the ordinary year, as reckoned according to the Gregorian calendar.

Gregorian Tones, in music, a tonal system introduced by Gregory the Great. In the early ages of church music the Greek system of tetrachords, or what was supposed to be the Greek system, was followed. There were in the time of Ambrose of Milan fifteen so-called Greek modes or scales in use. In order to simplify church music he selected four of these scales, the Dorian, Phrygian, Æolian, and Mixo-Lydian, to which he attempted to reduce all the chants and melodies sung in church. This selection of scales was soon found to be too limited. The church singers refused to be bound to it, and it failed to represent the melodies actually in use. In these circumstances Gregory the Great introduced a new reform and extension of church music. To each of the scales admitted by Ambrose he added a new scale or

mode, commencing with the fourth below the keynote of the original scale. These new scales he called *plagal*, while to the four introduced by Ambrose he gave the name of *authentic*. He introduced the practice of naming the tones by the letters of the alphabet. The following is the arrangement of his eight scales:—

1st.	Authentic (Dorian),.	D E F G A B C D
2d.	Plagal, ...	A B C D E F G A
3d.	Authentic (Phrygian),	E F G A B C D E
4th.	Plagal, ...	B C D E F G A B
5th.	Authentic (Æolian),.	F G A B C D E F
6th.	Plagal, ...	C D E F G A B C
7th.	Authentic, Hyper Dorian or Mixo-Lydian,	G A B C D E F G
8th.	Plagal, ...	D E F G A B C D

The scale of C, with the semitones between the 3d and 4th, and the 7th and 8th, which in the modern system is called the natural scale, and is the pattern on which all the others are formed, was thus, it will be seen, one of the plagal scales introduced as an innovation by Gregory.

Gregory (greg'o-ri), Patriarch of Constantinople, born in 1730, studied at Mount Athos, lived as a hermit, was made archbishop at Smyrna, and, in 1795, Patriarch of Constantinople. He led an active, tolerant, and benevolent life, promoted schools and the art of printing. In 1798, however, and again in 1806, he was accused of intriguing for the freedom of Greece, and twice banished to Mount Athos, though each time restored to his post after a short interval. But in 1821, when the Greek insurrection broke out in the Morea, his native country, he became once more an object of suspicion to the Porte, and when, shortly after, he allowed the family of Prince Morousi to escape from his guardianship, he was seized as he left the church on the first day of the Easter festival and hanged in his robes of office before the church gate.

Gregory, the name of sixteen popes, of whom we need notice only the following:—Gregory I, called also the *Great*, born at Rome, of noble family, about 540. He became a member of the senate, and was made prefect of Rome in 573. He expended his inheritance in the foundation of monasteries and charitable institutions, and then took monastic vows himself. Pope Pelagius II sent him on an embassy to Constantinople, and afterwards made him papal secretary. On the death of Pelagius in 590 he was chosen his successor. He displayed great zeal for the conversion of heretics, sending missionaries to Sicily, Sardinia, Lombardy, England, etc., as well as for the advancement of monachism, and the enforcement of clerical celibacy. He died in 604. The works ascribed to him are very numerous; his genuine writings consist of a treatise on the *Pastoral Duty*, *Letters*, *Scripture Commentaries*, etc. —Gregory VII (*Hildebrand*), born about 1020 at Soana, in Tuscany; passed part of his early life in Rome, became a monk at Cluny, and then returned to Rome with Bruno on the election of the latter to the papal chair. He exercised great influence over Leo IX (Bruno) and his successors, Victor II, Nicholas II, and Alexander II; and under Nicholas II he succeeded in depriving the clergy and people of Rome of a voice in the election to the pontificate by giving the power of nomination to the cardinals alone. On the death of Alexander II (1073) he was raised to the papal chair. His chief aim was to liberate the Church wholly from the domination of the State in political as well as ecclesiastical matters. He therefore prohibited simony and the marriage of priests (1074), and abolished lay investiture (1075), the only remaining source of the authority of princes over the clergy of their dominions. The Emperor Henry IV refused to obey this decree, and Gregory, after deposing several German bishops who had bought their offices of the emperor, and excommunicating five imperial councilors concerned in this transaction, summoned the emperor before a council at Rome to defend himself against the charges brought against him. Henry then caused a sentence of deposition to be passed against the pope by a council assembled at Worms. The pope, in return, excommunicated the emperor, and Henry, finding himself in difficulties, went to Italy and submitted at Canossa (1077) to a humiliating penance, and received absolution. After defeating Rodolph of Suabia, however, Henry caused the pope to be deposed by the Council of Brixen, and an anti-pope, Clement III, to be elected in 1080, after which he hastened to Rome and placed the new pope on the throne. Gregory passed three years as a prisoner in the castle of St. Angelo, and though finally liberated by Robert Guiscard, he was obliged to retire under the protection of Guiscard to Salerno, where he died in 1085. —Gregory XIII (*Ugo Buoncompagno*), born at Bologna in 1502; created cardinal in 1565; chosen successor of Pius V in the popedom in 1572. He permitted the Cardinal of Lorraine to make a public thanksgiving for the massacre of St. Bartholomew, encouraged plots against Queen Elizabeth, and incited Philip II to attack her. His foreign policy cost him much money for

subsidies to excite enemies to the Turks and heretics, and his financial expedients to fill his exchequer ruined the trade and disturbed the peace of his own dominions. He did much to encourage education, his expenditure for this purpose exceeding two million Roman crowns, out of which many colleges at Rome were endowed. He reformed the Julian calendar (see *Calendar*). He died in 1585.

Gregory, AUGUSTA, LADY, an Irish playwright, born in Roxborough, County Galway, in 1853. She is one of the founders of the Irish National Theater and author of many plays, including *Spreading the News*, *The Rising of the Moon*, *The Jackdaw*, *The Workhouse Ward* and *The Full Moon*.

Gregory, JAMES, mathematician and inventor of the reflecting telescope, born at Drumoak, in Aberdeenshire, about 1638, and educated at Marischal College. In 1663 he published *Optica Promota*, explaining the idea of the telescope which bears his name. He spent some years in Italy, and published at Padua in 1667 a treatise on the *Quadrature of the Circle and Hyperbola*. He became professor of mathematics at St. Andrews in 1668, and at Edinburgh in 1674, but died in 1675.

Gregory, JAMES, physician and author, son of the following, was born at Aberdeen in 1753; died in 1821. In 1780-82 he published his *Conspectus Medicinæ Theoreticæ;* in 1790 he became professor of the practice of physic, and in 1792 he issued his *Philosophical and Literary Essays*.

Gregory, JOHN, physician, grandson of James Gregory, the inventor of the reflecting telescope. He was born in 1724; died in 1773. His works include *Elements of the Practice of Physic*, a *Comparative View of the State and Faculties of Men and Animals*, and *A Father's Legacy to his Daughters*.

Gregory, OLINTHUS GILBERT, mathematician, born in Huntingdonshire in 1774; died 1841. He became mathematical master in the Royal Military Academy at Woolwich, and published a treatise on astronomy and several mathematical works, of which his *Treatise on Mechanics* was of most importance.

Gregory, THOMAS WATT (1861-), an American cabinet officer, born at Crawfordsville, Miss., educated at Southwestern Presbyterian University and the University of Virginia. He was admitted to the Texas bar in 1885, and became attorney-general of the United States in the cabinet of President Wilson in 1914, and resigned March 1, 1919.

Gregory of Nazianzus (*Gregorius Nazianzēnus*), a father of the Greek Church, born near Nazianzus, in Cappadocia, between 318 and 329; studied at Athens, and in 355 and 356 taught rhetoric in that city. He afterwards retired for some time with Basil to the Desert of Pontus. He began to preach in 362, and between 365 and 374 was associated with his father in the bishopric of Nazianzus. He went to Constantinople about 378 or 379 to oppose the Arians, and was appointed bishop of that see by Theodosius in 380, but in the following year retired to his former charge of Nazianzus. He died in 389 or 390. His works consist of letters, sermons, and poetry. His eloquence is nearly on a level with that of Basil and Chrysostom. His festival is on 9th May.

Gregory of Nyssa, a father of the Greek Church, brother of St. Basil, born at Sebaste, Pontus, about 332; died about 398. By his brother's influence he was made Bishop of Nyssa, in Cappadocia. Having opposed the Arians, he was banished at their instigation by Valens from 375 to 378. He took a prominent part in the Councils of Constantinople from 381 to 394. His festival is on 9th March. His works consist of dogmatic treatises, Scripture commentaries, sermons, letters, etc.

Gregory of Tours (*Gregorius Florentius*), historian of Gaul, born in Auvergne in 539 or 544; died at Tours in 595. He became Bishop of Tours in 573. He had the courage to oppose Chilperic and Fredegonde in their violent courses, and acted the part of a peacemaker in the dynastic quarrels of the period. His *Historia Francorum* is a valuable chronicle of sixth century events.

Gregory Thaumaturgus, SAINT, born in Pontus about 210 A. D.; became a Christian at an early age, and was a disciple of Origen; was bishop of Neocæsarea, from 244 till his death in 270. His life and miracles are narrated by Gregory of Nyssa.

Gregory the Illuminator, SAINT, the apostle of Armenia, born about 258 A.D. From 302 to 331 he was patriarch of the Armenian Church, but the last years of his life were passed as a hermit. He died about 342.

Gregory's Mixture, a popular stomachic and aperient medicine, consists of two parts of rhubarb, four of calcined magnesia, and one of ginger. It may be used

with benefit occasionally, but not systematically.

Greifenberg (grī'fn-berh), the name of several places in Prussia, particularly a walled town, province of Pomerania, government of Stettin. Pop. (1905) 7208.

Greifenhagen (grī'fn-hä-gĕn), a town of Prussia, province of Pomerania, government of Stettin. It has manufactures of woolen and linen cloth. Pop. 6473.

Greifswald (grīfs'vält), a town of Prussia, province of Pomerania, on the navigable river Rick, about 3 miles above its entrance into the Baltic. It contains a university, founded in 1456, attended by about 600 students, and possessed of a library (100,000 vols.), museum, observatory, etc. It has manufactures of machinery, oil, paper, and tobacco; and a considerable shipping trade. Greifswald was one of the Hanse towns about 1270; was assigned to Sweden by the Peace of Westphalia 1648; was occupied successively by various northern powers, and finally ceded to Prussia in 1815. Pop. (1905) 23,750.

Greiz (grīts), a town of Germany, principality of Reuss Greiz, in a valley on the right bank of the Elster, 16 miles south of Gera. It is the residence of the elder branch of the Reuss family; is walled, well built, and has a castle and palace. Pop. (1905) 23,114.

Grenada (gren-ā'da), one of the British West Indian Islands; about 85 miles northwest of Trinidad; oblong in form, 24½ miles long, N. and S., and 10 miles broad; area 133 square miles. The island is traversed north to south by an irregular mass of volcanic mountains, attaining elevations of 3000 and 3200 feet above sea-level, and having lateral branches of lower hills. Cocoa, sugar, rum, and spices stand first in the exports. The island has a lieutenant-governor, and a local legislature consisting of a council and a house of assembly of seventeen elected members. The capital is St. George Town. Grenada was discovered by Columbus in his third voyage in 1498, and colonized about the middle of the seventeenth century by the French, who exterminated the Caribs. In 1762 it was taken by the British, and though recaptured by the French in 1779 was restored to Britain in 1783. Pop. 65,627, of whom only a few hundreds are whites.

Grenade (gre-nad), a small explosive shell, thrown by the hand. The term was first used by Du Billey, in reference to the siege of Arles (1536). Until about the end of the 17th century, when musketry became common, soldiers of the line were trained to throw grenades, hence the name grenadier (*q. v.*). Discarded for a long time the grenade was revived by the Japanese in the Russo-Japanese war (1904-05). Its importance in warfare grew, and during the European war grenades of various types were used by all the belligerents. The hand grenade of 1918, made of cast iron or composition metal, was ovoid in form and was exploded by an automatic device. It differed from the earlier models in that instead of exploding at the point of contact it went off while still in the air. These grenades were charged with suffocating, tear-producing, or incendiary gases, which were as effective as the splintered shell. A form of grenade much used in the trenches was made of a cane handle with a metal head, containing the bursting charge of lyddite, and the detonator to effect the explosion when the missile struck; attached to the handle was a piece of cloth to act as the tail and make the grenade strike on its detonating head. In the *rifle grenade* a stout cylindrical tube is inserted into the muzzle of an ordinary gun. These grenades could be thrown 35 or 40 yards. For longer distance the rifle grenade was used. The latest model of rifle grenade is cylindrical in form and can be fired with an ordinary cartridge. The grenade is inserted into a wide-mouthed attachment that makes the rifle look like an ancient blunderbuss. Pointed into the air at an angle of 45 degrees a rifle grenade weighing one pound can be thrown a distance of more than 200 yards. The *mine grenade* is the invention of N. W. Aasen, a Norwegian engineer. It consists of a cylinder with a conical point, containing the projectiles and explosive charge as well as the mechanism necessary to force it up from the ground where it is buried.

Grenadier (gren-a-dēr'), originally a soldier destined to throw the hand-grenades. Soldiers of long service and acknowledged bravery were selected for this service, so that they soon formed a kind of *élite*. There were at first only a few grenadiers in each regiment. Companies of grenadiers were formed in France in 1670, in England a few years later. With the development of the musket the name soon became only a *souvenir* of the ancient practice; the troops so called generally formed one battalion of a regiment, distinguished by the height of the men and a particular dress, as for instance, the high bearskin cap. With the British and French the grenadier company was the first of each battalion. The title in the British army

remains only in the regiment of Grenadier Guards.

Grenadine (gren'a-dēn), a thin gauzy silk or woolen fabric, plain, colored, or embroidered, used for ladies' dresses, shawls, etc.

Grenadines (gren'a-dēns), or GRENADILLES, a chain of small islands and rocks in the West Indies, between the islands of Grenada and St. Vincent; principal island, Carriaco. They produce coffee, indigo, cotton, and sugar. Pop. 6796.

Grenfell (gren'fel), WILFRED THOMASON, a medical missionary, born near Chester, England, in 1865. He began his career as a medical missionary in England in 1887, and subsequently became superintendent of a Labrador branch of the Mission to Deep Sea Fishermen. His work among the people of Labrador has been of the most self-sacrificing and beneficial character, and he has brought about great improvement in their sanitary and other conditions, including, recently, the introduction of the Lapland reindeer to that country. Has written several works on Labrador and his experiences.

Grenoble (gre-nō'bl), a fortified town of Southern France, capital of the department of Isère, finely and strongly placed on the Isère, 60 miles southeast of Lyons. Grenoble occupies both sides of the river, which is crossed by three bridges, and lined by fine quays. It has a cathedral, and a more noteworthy church (Saint-André), with the tomb of Bayard; a public library of 170,000 volumes and 7500 MSS.; a college, museum, bishop's palace, courthouse, arsenal, and extensive public gardens. The manufactures consist of gloves, which may be considered the staple, linen and hemp goods, liqueurs, leather, etc. Grenoble existed in the time of Cæsar; and Gratian, who had improved it, changed its name from Cularo to Gratianopolis. Pop. (1910) 77,438.

Grenville (gren'vil), GEORGE, a British minister, younger brother of Earl Temple, and father of William Wyndham, the first Lord Grenville; born in 1712; died in 1770. He became treasurer of the navy in 1754; secretary of state and subsequently Irish lord of the admiralty in 1762; first lord of the treasury and chancellor of the exchequer in 1763. In 1763 he introduced a scheme of colonial taxation, and in 1764 proposed a stamp tax to be levied in the American colonies, which was one of the proximate causes of the American war of independence. In 1765 he retired from office, and was replaced by Lord Rockingham. The *Grenville Papers* (1852-53) contain his most important political correspondence.

George Grenville.

Grenville, WILLIAM WYNDHAM, LORD, third son of the above; was born in 1759. In 1783 he was appointed paymaster-general of the army; in 1789 became speaker, and in the same year became secretary of state for the home department. In 1790 he was raised to the peerage as Baron Grenville, and from 1791 till Pitt's resignation in 1801 held the post of foreign secretary. On the return of Pitt to office in 1804 he declined to join him, and continued in opposition till Pitt's death, when he became the head of a coalition ministry, including Fox and Grey, 1806. The ministry resigned in 1807, after having passed an act for the abolition of the slave trade. He did not again take office. He died in 1834.

Gresham (gresh'am), SIR THOMAS, a merchant of London, born in 1519. In 1552 he was sent agent of Henry VIII's money affairs to Antwerp, where in two years he paid off a heavy loan, and raised the king's credit considerably. On the accession of Elizabeth he was deprived of his office, but it was soon restored to him, and he was also knighted. In 1566 he erected at his own expense the Royal Exchange for the merchants of London. He died in 1579. The 'Gresham Law,' in finance, is the principle that a less valuable currency inevitably supplants and drives out the more valuable, in direct proportion to the abundance of the former medium.

Gresham, WALTER Q., statesman, was born near Lanesville,

Indiana, in 1832; died in 1905. He was elected to the legislature as a Republican in 1856, served through the Civil war, retiring as brevet major-general, and was United States district judge for Indiana, 1869-82. He was appointed postmaster-general in 1882 and Secretary of the Treasury in 1884. Joining the Democratic party in 1892, he was appointed Secretary of State by President Cleveland. His career as judge was marked by his support of popular rights.

Gretna Green (gret'na), a village of Scotland, 8 miles north of Carlisle, was long notorious for the celebration of the marriages of fugitive lovers from England. To conclude a lawful (though irregular) marriage in Scotland, it was only necessary for an unmarried couple to go and declare themselves man and wife before witnesses, and it was in this way that these runaway couples were married; but such marriages were put an end to in 1856, by an act declaring that no irregular marriage in Scotland should be valid unless one of the parties had resided in Scotland for twenty-one days next preceding such marriage.

Greuze (grœz), JEAN BAPTISTE, a famous French painter, born in Burgundy, 1726. Although he devoted some time and attention to historical subjects, he later confined himself to depicting scenes of the family life of the *bourgeois* or middle class. As a colorist he occupies a high place. He died in 1805.

Grévy (grā-vē), FRANÇOIS PAUL JULES, French president, was born at Mont-sous-Vaudrey, France, in 1807; died in 1891. He took part in the revolution of 1830 and afterwards, as a lawyer, defended in the courts some of his fellow-insurgents. He was vice-president of the Constitutional Assembly of the 1848 republic, and president of the National Assembly of the new republic, 1871-73 and 1876. In 1879 he was chosen president of the French republic by a large majority and reëlected in 1886, but resigned in 1887 in consequence of a scandal in which his son-in-law was implicated.

Greville (grev'il), SIR FULKE, LORD BROOKE, an English writer; born in 1544. Having studied at Cambridge and Oxford and made the tour of Europe, he became a courtier, and enjoyed the favor of Elizabeth, James I, and Charles I. In 1628 he was stabbed by an old servant, and immediately expired. He wrote the life of Sir Philip Sidney; *Cœlica*, a collection of 109 songs; *Alaham* and *Mustapha*, two tragedies, etc.

Greville, HENRY. See DURAND, ALICE.

Grey (grā), CHARLES, EARL, an English statesman, eldest son of Charles, first Earl Grey; born in 1764; died in 1845. He was educated at Eton and at King's College, Cambridge. In 1786 he was returned to Parliament as member for Northumberland. On the accession of the Grenville ministry in 1806, Grey, now Lord Howick, was made first lord of the admiralty, and on the death of Fox succeeded him as secretary for foreign affairs and leader of the House of Commons. The death of his father in 1807 raised him to the House of Peers, and from this period up to 1830 he headed the opposition in the Lords, and especially opposed the proceedings against Queen Caroline. On the accession of William IV and the retirement of the Wellington ministry, Earl Grey was summoned to office. The great event which marks his administration is the passing in 1832 of the first reform bill.

Grey of Fallodon, EDWARD GREY, first Viscount, British statesman, foreign secretary from 1905 to 1916, was born in 1862 and held office as under-secretary for foreign affairs from 1892-95. It was during his control of the foreign office that the European war broke out (1914). He was appointed Ambassador to the United States in 1919.

Grey, SIR GEORGE, a British colonial governor, was born at Lisbon, Portugal, in 1812; died in 1898. He traveled in Australia in 1837 and published an account of his journey. He was successively appointed governor of Southern Australia, of New Zealand, of the Cape of Good Hope.

Grey, LADY JANE, an interesting figure in English history, the daughter of Henry Grey, marquis of Dorset, afterwards duke of Suffolk, by Frances, daughter of Charles Brandon, duke of Suffolk, and Mary, younger sister of Henry VIII, in whose reign Lady Jane was born, in 1537. She displayed much precocity of talent; and under the tuition of Aylmer, afterwards bishop of London, she acquired a knowledge of the learned languages, as well as French and Italian. She was married to Lord Guilford Dudley, fourth son of the Duke of Northumberland, in 1553. Edward VI, who died in 1553, was induced on his deathbed to settle on her the succession to the crown. The council endeavored to keep his death secret, with a view to secure the persons of the princesses, Mary and Elizabeth, and when Mary discovered the design the council proclaimed Lady

Jane queen. On the approach of Mary, however, the council deserted Lady Jane, and Mary was proclaimed queen. Jane was now confined to the Tower. She and her husband were arraigned, and pleaded guilty of high treason; but their doom was suspended, and it was not until after the suppression of the rebellion of Sir Thomas Wyatt, in which the Duke of Suffolk, Lady Jane's father, had participated, that the sentence was executed. She and her husband were beheaded on Tower Hill, February 12, 1554.

Grey. See *Gray*.

Grey Friars. See *Franciscans*.

Greyhound (grā'hound), a variety of dog, distinguished by a greater length of muzzle than any other; very low forehead, short lips, thin and long legs, small muscles, contracted belly, and semi-pendent ears. There are several varieties, as the Irish greyhound, the Scottish, the Russian, the Italian, and the Turkish. The common greyhound is of an elegant make of body, and is universally known as the fleetest of dogs. A good hound has a fine, soft, flexible skin, with thin, silky hair, a great length of nose, contracting gradually from the eye to the nostril, a full, clear, and penetrating eye, small ears, erect head, long neck, chest capacious, deep, but not wide, shoulders deep and placed obliquely, ribs well arched, contracted belly and flank, a great depth from the hips to the hocks of the hind-legs, fore-legs straight and shorter than the hinder. The name appears to have no reference to the color, but is derived from the Icelandic *grey*, a dog. They are chiefly used in the sport of coursing, a work for which their peculiar shape, strength, keenness of sight and speed make them exceedingly well fitted. This sport is preferred by many to horse-racing. (See *Coursing*.)

Greytown (grā'toun), SAN JUAN DE NICARAGUA, or SAN JUAN DEL NORTE, the principal seaport of Nicaragua. It has considerable trade in the exportation of hides, India rubber, mahogany, and fruits. Pop. about 2500.

Grieg (grēg), EDVARD, a Norwegian composer and pianist, born in 1843; died in 1907. He is best known by his compositions for the piano; but he also wrote orchestral suites, cantatas, quartets, trios, etc., as well as a number of charming songs. His works belong to the modern Romantic school and are distinctly Scandinavian in character.

Griffin (grif'in), or GRYPHON, a fabulous monster of antiquity, also common in heraldry, commonly represented with the body, the feet, and claws of a lion, and the head and wings of an eagle. India, or Scythia, was assigned as the native country of the griffins; legend assigned them as guardians of the gold.

Griffin, the capital of Spalding County, Georgia, 48 miles S. of Atlanta. Large quantities of cotton are shipped, and there are cotton factories, cotton gins, etc. Pop. 7478.

Grillparzer (gril'pär-tsér), FRANZ, a German poet and dramatist, born at Vienna, 15th January, 1791. Having entered the service of the imperial court, he rose through various dignities, and at last was appointed member for life of the imperial council. He was the author of lyrical and other poems, a novel, travels, etc., and of the dramas *Sappho*, *Das Goldene*, *Vliess*, *Das Meeres und der Liebe Wellen*.

Grilse (grils), the name given to the young of the salmon (smolts) after they return for the first time from the sea to fresh water. They then sometimes weigh from 5 to 8 or 9 lbs.

Grimaldi Family (gre-mal'dē), one of the four families of the high nobility in Genoa. The lordship of Monaco belonged, for more than 600 years (beginning with 980), to the Grimaldi, and the ruler is still a Grimaldi. With the Fieschi they always played an important part in the history of Genoa, especially in the disputes between the Ghibellines and the Guelfs, to which latter party both families belonged.

Grimaldi's Fringes, a term in optics given to the colored bands observed when a beam of light passing through a narrow slit falls on a screen. They are due to interference of the luminous waves, and are named from Francesco Maria Grimaldi, who wrote a treatise on the subject. See *Diffraction*.

Grimm (grim), FRIEDRICH MELCHIOR, BARON, a German man of letters, who lived mostly in Paris and wrote in French. He was born in 1723 at Ratisbon, and having finished his studies, he went to Paris and there became acquainted with Jean Jacques Rousseau, Diderot, D'Alembert, D'Holbach, and other Parisian philosophers. He corresponded with Catharine II of Russia, Gustavus III of Sweden, and other great personages. Frederick the Great among others gave him marks of great esteem. In 1776 he was appointed envoy from the Duke of Saxe-Gotha to the French court, and honored with the title of baron. On the revolution breaking out he retired to Gotha, where he died in 1807. His

Correspondence Littéraire possesses great literary and historical value.

Grimm, Jakob Ludwig, a German philologist, born at Hanau in Hesse-Cassel, 1785. He was educated partly at Cassel, and finally at Marburg University. In 1806 he became librarian to Jerome Bonaparte, king of Westphalia, and from 1816 to 1829 he occupied the post of second librarian at Cassel. From 1830 to 1837 he resided at Göttingen as professor and librarian, lecturing on the German language, literature and legal antiquities. Having, along with other six professors, resisted the unconstitutional encroachments of the King of Hanover, he was banished, and after his retirement to Cassel, he was, in 1841, called to Berlin as a professor and member of the Academy of Sciences. He sat in the National Assembly of 1848, and in that of Gotha in 1849. From that time till his death, which took place at Berlin, 1863, he occupied himself only with his various publications. He wrote on German mythology, German legal antiquities, the history of the German language, and published old German poems, etc. His two greatest works, both unfinished, are his *Deutsche Grammatik* ('German Grammar,' vols. i.—iv., 1819-37), and his *Deutsches Wörterbuch* ('German Dictionary') commenced in 1852, in conjunction with his brother Wilhelm, and being gradually completed by eminent scholars. He also published, in company with his brother, the *Kinder- und Hausmärchen*, one of the most popular collections of juvenile fairy tales.

Grimm, Wilhelm Karl, brother of the preceding, born 1786, was educated at Cassel and Marburg, and in 1830 he followed his brother to Göttingen, and obtained a professorship. He joined in his brother's protest against the abrogation of the new Hanoverian constitution, and was deprived of his office. Having obtained an appointment in Berlin, he died in that city in 1859. He devoted himself especially to the German mediæval poetry, and published a treatise, *Ueber die deutschen Runen*, a translation of *Altdänische Heldenlieder, Balladen und Märchen*, etc., all with valuable introductions and disquisitions.

Grimma (grim'ma), a town, Kingdom of Saxony, on the Mulde, 17 miles E.S.E. of Leipzig, charmingly situated, and with some interesting old buildings. Pop. (1905) 11,182.

Grimm's Law, so called from its discoverer, Jakob Grimm, formulates the principle of the interchange of the mute consonants in the Aryan languages, in words derived from the same roots. For example: *p*, *b*, and *f* in Latin, Greek, and Sanskrit are in Gothic and English, Dutch, etc., respectively represented by *f*, *b*, and *b*, and in Old High German by *b* (*v*). *f*, and *p*. The subjoined table exhibits the principal mutations:—

	Labials.	Dentals.	Gutturals.
Greek (Latin, Sanskrit)	*p, b, f*	*t, d, th*	*k, g, ch*
English (A. Sax.), Gothic, etc.	*f, p, b*	*th, t, d*	*h, k, g*
Old High German.	*b* (*v*), *f, p*	*d, g, t*	*g, ch, k*

As examples:—E. *father* = L. *pater*, Gr. *patēr*, Skr. *pitri;* E. *brother* = L. *frater*, Gr. *phratēr*, Skr. *bhratar;* E. *kin* = *genus*, Gr. *genos;* E. *head*, A. Sax. *heafod* = L. *caput*, Gr. *keph* (*alē*), etc.; E. *thin* = L. *tenuis*, Gr. *tanaos*. Certain exceptions to the law are explained by a law subsequently discovered, called Verner's law.

Grimsby (grimz'bi), Great, a borough and thriving seaport of England, County of Lincoln, on the Humber. The docks occupy an area of about 140 acres, and there is a large trade with continental ports. Grimsby is one of the most important fishing ports of the kingdom. Pop. (1911) 74,663.

Grimsel (grim'zl), a pass in Switzerland at the eastern extremity of the Bernese Alps, 7103 feet in height, and connecting the valleys of the Aar and the Rhone.

Grindelwald (grin'dl-vâlt), one of the most beautiful of the upper Alpine valleys of Switzerland, about 36 miles southeast of Berne, containing two immense glaciers. The village of Grindelwald consists of picturesque cottages, and the inhabitants, 3370 in number, are chiefly employed in rearing cattle.

Grinding (grind'ing), a mechanical process in which certain effects are produced by attrition. This process prevails in various mechanical arts, as in grinding corn, etc., the object of which is to reduce the materials to a fine powder; or in grinding metals for the purpose of giving them a certain figure, polish, or edge. In the first case the grinding or crushing is effected by rough stones, or, as in crushing ores, between heavy metal cylinders, or by a heavy stone or iron cylinder revolving upon a smooth plate. (See *Mill.*) The grinding of cutlery is effected by means of the grindstone (see below); emery powder grinds glass lenses and specula. Ornamental glass is ground into facets by stones and lap-wheels. Diamonds and other precious stones are ground with diamond dust. What is called *dry grinding*

is the grinding of steel with dry grindstones. The points of needles are produced by this means, also the finishing of steel pens. Sand-jet grinding is a process in which abrasion is effected by the percussion of small hard particles on a plain surface, sharp siliceous sand being impelled by a blast artificially produced of steam or of air. By the use of flexible jointed connecting tubes the jet can be turned in any direction.

Grindstone (grīnd'stōn), a cylindrical stone, on which sharpening, cutting, and abrasion are effected by the convex surface while the stone is revolving on its axis. They are made of sandstone, or sandstone grit of various degrees of fineness.

Grinnell, a city in Poweshiek County, Iowa, 55 miles E. by N. of Des Moines. It is the seat of Iowa College. Products are carriages, gloves, washing machines, etc. Pop. 6478.

Grinnell Land, a large Arctic island lying west of Northern Greenland and north of Ellesmere Land. From its northern coast set out Peary's expedition which discovered the North Pole in 1909. It was named after Henry Grinnell (1799-1874), a New York merchant, who supplied the funds for the De Haven and Kane Arctic expeditions.

Gripes (grīps), a painful affection of the bowels, caused by constipation or diarrhœa. If spasms occur, the term 'colic' is applied.

Grippe (grip), LA. See *Influenza*.

Griqualand East (grē'kwa-land), a region of South Africa, formerly known as No Man's Land, lying south of Natal between Pondoland and Basutoland. It was incorporated with Cape Colony in 1874. Area, 7549 square miles. Pop. about 200,000.

Griqualand West, a district of South Africa north of the Orange River, and west of the Orange Free State; 180 miles from east to west, and 120 from north to south; area, about 15,190 square miles. The prevailing character of the surface is that of undulating grassy plains suitable for grazing. Previous to the discovery of the diamond fields in the basin of the Vaal River, Griqualand was little known. In 1870 large finds of diamonds in that district began to attract wide notice, and in 1871 Waterboer, the Griqua chief, ceded all his rights to the British government, and the territory was incorporated with Cape Colony. The chief centre of the diamond-mining industry, and the seat of government, is Kimberley. The Griquas are a mixed race sprung from the intercourse of the Boers with their Hottentot slaves. Pop. about 100,000.

Griselda (gri-zel'dà), the name of the famous heroine of a popular mediæval tale, first met with in Boccaccio's *Decameron*, probably with an historical foundation. Chaucer describes her as 'the Patient Griselda,' in one of his Canterbury tales. A poor girl, married to a marquis, he put her patience and obedience to the severest tests. She bore all these with loving wifely fortitude and they lived lovingly together afterwards.

Grisi (grē'sē), GIULIA, a celebrated Italian vocalist, born at Milan, 1811 or 1812. After having studied music at Bologna, and made her *debut* in Rossini's Zelmira, she appeared at Milan as Norma. She acquired great celebrity at Paris, in England, and America. She subsequently married Mario, the great tenor singer. Her voice gave way in her later years, and she died at Berlin in 1869. Her principal character was Norma.

Gris-Nez (grē-nā), CAPE, a headland, the northwest extremity of France, dep. Pas-de-Calais, the nearest point of the French shore to that of Britain, the distance being barely 21 miles. It has a revolving light, 195 feet high.

Grisons (grē-sōn); (Ger. *Graubünden*), the largest and most easterly canton of Switzerland, bordering on Austria and Italy; area, 2773 square miles. Its boundaries and interior consist almost entirely of mountain chains, including more than twenty peaks above 9000 feet. The canton may be regarded as embracing three great valley districts, of which the Upper and Lower Engadine (Inn valley) attain considerable breadth. The Inn, which flows to the Danube, and the Vorder and Hinter Rhine, are the principal rivers. The lakes are numerous, and many of them present scenery of the most magnificent description. The climate varies greatly, ranging from the perpetual winter of the mountains to the almost Italian air of some of the valleys. The canton is in general pastoral, feeding large numbers of cattle and sheep. The mountain forests supply much timber. A considerable transit trade is carried on between Italy and Germany. The canton was admitted into the Confederation so late as 1803. Both the Protestant and the Roman Catholic religion are established. The language of the public acts is German, and the people speak Ger-

man, Romansch, or Italian. Pop. 104,520.

Griswold (gris'wuld), RUFUS WILMOT, an American writer, born in Vermont in 1815. After having traveled extensively both in his own country and in Europe, he became successively a printer, a Baptist preacher, and a journalist. He was the author of *The Poets and Poetry of America*, etc. He was one of the editors of Edgar A. Poe's works. He died in 1857.

Grit, is a sandstone, coarse-grained, with particles more or less angular, connected by a cement of a hard siliceous nature.

Grivegnée (grēv-nyā), a town in Belgium, province of Liége, on the Ourthe. It manufactures steam-engines, and has worsted and fulling mills. Pop. 10,550.

Grizzly Bear, a large and fierce American bear, inhabiting the Rocky and neighboring mountains. Its name is derived from its grayish, grizzled hair. It feeds on both vegetable and animal food, grows at times to the length of 9 feet, and is dreaded by hunters from its great strength and savage disposition.

Groat (grōt), an English silver coin, coined by Henry III in 1249, and by Edward III, in 1351. It was equal to fourpence in value. A coin of this value, the *fourpenny-piece*, was revived in 1835, but none have been struck since 1856, and all are now withdrawn from circulation.

Groats, the seeds of oats prepared as an article of food by being deprived of their hulls. They are much used in the preparation of gruel for invalids.

Grodno (grod'nō), a town of Russian Poland, capital of the government of same name, on the Niemen, 160 miles northeast of Warsaw, a poorly-built place, the principal edifice being a palace erected by Alexander III. The manufactures consist of woolen, linen, and silk goods, firearms, etc. Pop. 46,871.—The government has an area of 14,931 square miles, largely occupied by pine forests and swamps. Pop. 1,826,600.

c c, Groins.

Groin, the angular curve made by the intersection of two semi-cylinders or arches. It is either regular or irregular:—*regular*, as when the intersecting arches are of the same diameters and heights; and *irregular*, when one of the arches is semicircular, and the other semi-elliptical. In Gothic architecture groins are always ribbed.

Gromwell (grom'wel), the name of plants of the genus *Lithospermum*, nat. order Boraginaceæ, containing a number of widely distributed species, several of which are natives of America. The seeds of *L. officinale* are occasionally used as a diuretic.

Groningen (grō'ning-en), a town of Holland, capital of a province of same name, situated on the river Huns, here converted into a canal, 92 miles northeast of Amsterdam. It is a rich place, adorned with many excellent buildings, and has numerous canals crossed by bridges. The principal edifices are the cathedral, a fine exchange, and the university. It has manufactures of white lead, soap, etc., oil, fulling, and saw mills, and an excellent harbor, with an active trade. Pop. 67,563.—The province forms the northeastern portion of Holland; area, 790 square miles. It is protected against the encroachments of the sea by dykes, is very level, and is intersected by innumerable canals. The inhabitants, 299,602, nearly all belong to the Calvinistic church.

Gronovius (gro-nō'vi-us; properly *Gronov*), the name of several Dutch classical scholars:—(1) JOHANN FRIEDRICH, born at Hamburg in 1611, succeeded Daniel Heinsius as professor of belles-lettres at Leyden (1658), and died there in 1671. His editions of Livy, Statius, Justin, Tacitus, Gellius, Phædrus, Seneca, Sallust, Pliny, Plautus, etc., are valuable.—(2) His son JAKOB, born at Deventer in 1645; studied there and at Leyden. He afterwards became professor of belles-lettres at that university, and died in 1716. He edited Tacitus, Polybius, Herodotus, Pomponius Mela, Cicero, Ammianus Marcellinus, etc., and compiled a *Thesaurus Antiquitatum Græcarum* (Leyden, 1697, thirteen vols. fol.).—(3) His son ABRAHAM, born at Leyden in 1694, edited Justin, Pomponius, Mela, Tacitus, and Ælian. He died at Leyden in 1775.

Groote Eylandt (grō'te ī'lant; 'great island'), the largest island in the Gulf of Carpentaria, north of Australia, belonging to the colony of S. Australia; greatest length and breadth 40 miles each.

Gros (grō), ANTOINE-JEAN, BARON, a French historical painter, born at Paris in 1771. He studied art

under David, and subsequently became a staff officer in the French army. In this position he produced his picture of the Victor of Arcola, by which he secured the favor of Napoleon. In 1804 he produced his *Plague at Jaffa*, with Napoleon visiting the sick, a work which was crowned at the Louvre. He painted various battle scenes; but his chief work is probably the Cupola of St. Geneviève at Paris, exhibiting the saint protecting the throne of France, represented by Clovis, Charlemagne, St. Louis, and Louis XVIII. The artist received for it 100,000 francs and the title of baron. The rise of the romantic school deprived him of his popularity, and he drowned himself in the Seine in 1835.

Grosbeak (grōs'bēk), a general popular name for birds of at least three groups belonging to the conirostral division of the Insessores. The first comprises the cross-bills; in the second group is the East Indian representative genus *Paradoxornis*, with the beak large and parrot-like, but not crossing; the third group includes the pine grosbeak (*Pinicola enucleator*) and the bullfinch. The term grosbeak was given to birds which had beaks proportionally larger than in the most familiar forms of bird life.

Groschen (grō'shen), a name for German coins of which the oldest known were struck in Trèves in 1104. In 1525 the groschen was divided into twelve pfennige. In the currency system existing up till 1872, the groschen was a silver coin = 1 1/5*d*. sterling, there being 30 to the *thaler* of about 3*s*. sterling.

Grose (grōs), Francis, an English antiquary, born in 1731. Having dissipated the fortune inherited from his father, he turned his attention to the study of antiquities. In 1773 he commenced the publication in numbers of his *Views of Antiquities in England and Wales*. In 1789 he made a tour in Scotland for the purpose of illustrating the antiquities of that country. Before completing it, however, he proceeded to Ireland, with the view of collecting its antiquities, but was suddenly carried off by apoplexy in 1791. His name is now perhaps chiefly remembered from his connection with Burns, who wrote his *Tam o' Shanter* for him. Captain Grose also wrote a *Treatise on Ancient Armour and Weapons*, a *Classical Dictionary of the Vulgar Tongue*, and other interesting publications.

Gross, in opposition to *net*, is applied to merchandise, including the weight of that in which it is packed. Thus we say, 'The bag of coffee weighs 9 cwts. *gross*,' that is, including the weight of the bag.

Gross, Samuel D., an eminent surgeon, born at Easton, Pennsylvania, in 1805; died in 1884. He was the founder and chief editor of the *Medico-Chirurgical Review*, and president of the American Medical Association in 1867. He became professor of surgery in the Jefferson Medical College of Philadelphia in 1856, and was the author of some valuable works on surgery.

Grossenhain (grōs'en-hīn), a town, kingdom of Saxony, 20 miles N. W. of Dresden, on the left bank of the Röder. Woolen and cotton goods, etc., are manufactured. Pop. 12,064.

Grosseteste (gros'test), Robert, an eminent English scholar and prelate, was born about the year 1175; studied first at Oxford, and then went to Paris, where he mastered the Hebrew and Greek languages. On his return to England he became lecturer in the Franciscan school at Oxford, and acquired a great reputation for his linguistic abilities, his skill in logic, etc. In 1235 he was appointed Bishop of Lincoln, but soon came into collision with Pope Innocent IV on the question of the induction of foreigners into English benefices. He refused to institute the pope's nephew, Frederick di Lavagna, to a canonry at Lincoln, and disregarded the papal fulminations which he thus incurred. He died in 1253. His writings, few of which have been published, are very voluminous.

Grosseto (grō-sā'tō), a province of Tuscany, Italy; area, 1712 square miles; pop. 144,722. Being mountainous and marshy it is little adapted for cultivation. Its capital, Grosseto, on the Ombrone, is the seat of a bishop, and has a beautiful cathedral. Pop. 9,600.

Grossulaceæ (grō-sū-lā'se-ē), Grossulariaceæ, a tribe of plants of the nat. order Saxifragaceæ, comprehending the gooseberry and currant of gardens, and consisting, in fact, of only one genus, Ribes; they are natives of most parts of the world except Africa and the tropics.

Grosswardein (grōs'vär-dīn), a royal free city of Hungary, capital of County Bihar, in a beautiful plain, on the Körös. It consists of the town proper, surrounded by walls, and otherwise fortified, and of extensive suburbs, is tolerably well built, and is a railway center. The staple manufacture of the city is earthenware. Pop. 50,177.

Grosvenor Gallery (grō've-nor), a building erected in 1877 by Sir Coutts Lindsay in New Bond Street, London, for annual exhibitions of pictures. In these exhibitions preference has generally been given to certain schools of art, represented by such names as Burne Jones, Rossetti, etc., and in general to work which appeals more to a peculiar æsthetic taste than to the popular mind.

Grote (grōt), GEORGE, an English historian and politician, was born in 1794; died in 1871. His grandfather, descended from German ancestors, was one of the original partners of the London banking-house of Prescott, Grote & Co. Having been educated at Sevenoaks and at the Charterhouse, he entered in 1810 as a clerk in his father's banking establishment. As early at 1823 he began to collect materials for his *History of Greece*. In 1832 he was elected a member of Parliament for the city of London, and his subsequent parliamentary career, until his retirement in 1841, was principally devoted to the advocacy of vote by ballot. He was also a leader of the 'Philosophic Radicals.' In 1846 appeared the first two volumes of his *History of Greece*. The remaining ten volumes followed in rapid succession, the final volume being published in 1856. The work terminates with the death of Alexander the Great, and as a whole is a monument of erudition. In 1865 he published *Plato and the Other Companions of Sokrates*, and was engaged at the time of his death on an elaborate treatise on Aristotle and the Peripatetics. In the latter part of his life he was concerned in the management of University College, the London University, and the British Museum.

Grotesque (grō-tesk'), in art, a capricious variety of arabesque ornamentation, which, as a whole, has no type in nature, the parts of animals, plants, and other incongruous elements being combined together. It was used by the Romans in decorative painting and revived by the artists of the Renaissance.

Grotius (grō'she-us), or DE GROOT, HUGO, a Dutch scholar, born at Delft, 1583. He entered the University of Leyden when only eleven, was a pupil of J. J Scaliger, under whose supervision he edited *Marcianus Capella* and the *Phenomena of Aratus*. In his fifteenth year he was graduated, and in the year after he accompanied the Dutch ambassador to France. Having sided with the party of the Remonstrants, Grotius was condemned to perpetual imprisonment by the opposite and successful party, but he escaped. Louis XIII granted him a pension, subsequently withdrawn. After several vicissitudes he went to Stockholm, entered the service of Queen Christina, and was appointed ambassador to France in 1635. He died at Rostock in 1645. His greatest work is *De Jure Belli et Pacis* (1625), on the fundamental principles of international law.

Groton (grō'ton), a town of New London county, Connecticut, on Long Island Sound and the Thames River, which separates it from New London. It has important manufactories and possesses a fine revolutionary monument. Pop. 6496.

Grouchy (grō'shē), EMMANUEL, MARQUIS DE, a noted French general, born at Paris in 1766. He entered the Royal Life Guards at the age of fourteen, saw much service, and highly distinguished himself. In the war with Prussia in 1806, and Russia (1807), and at Wagram, he acquired increased renown. In 1815 he defeated Blücher at Ligny. Having been ordered to follow the Prussian retreat, he failed, through some misapprehension of orders, to aid Napoleon at Waterloo. He was banished under the second restoration, and lived for a few years in Philadelphia. He returned to France in 1821, and died in 1847.

Ground, in painting, the first layer of color. The Italian school preceding and during the time of Raphael employed white grounds, but afterwards, when canvas had superseded panels, the Italian and Spanish schools adopted an oil ground of a dull red color. The Dutch and Flemish masters used light grounds varying from white to gray, and their example has been followed by the English painters and those of the modern European schools.

Ground Dove, a name of various species of pigeons, which resemble the gallinaceous birds in living mainly on the ground, their feet being better suited for walking than perching. The name is especially given to the members of the genus *Chamæpelia*, small birds belonging to the warmer parts of America, and includes the bronze-wing pigeons of Australia. The large pigeons of the genus *Goura* (the crowned pigeons) are also so called. See *Goura*.

Ground-hog. Same as *Aardvark*.

Ground-Ice. See *Anchor-Ice*.

Ground Ivy, *Glechoma hederacea*, a common wayside

plant of the order Labiatæ, with a creeping stem and purple flowers. Tea made from it is used by the poor for pectoral complaints. It was formerly employed to flavor ale.

Groundnut, a term which denotes the seeds of pods of the *Arachis hypogæa*, or the tubers of certain umbellifers (earthnuts). The *Arachis hypogæa* is a leguminous annual of diffuse habit, with hairy stem, and abruptly pinnate leaflets. The nut or pod is situated at the end of a stalk of some length, and is ripened under ground, this stalk having the peculiarity after flowering of bending down and pushing the fruit into the earth. The plant is extensively cultivated in the United States and in several tropical countries. The nuts have an agreeable flavor and are largely eaten after having been roasted, while they yield an oil that may be used for olive-oil. When ground up finely and mixed with oil, are called *peanut-butter*. See also *Earthnut*.

Ground-pine (*Ajuga Chamæpitys*), a herbaceous labiate plant, so called from its resinous smell. Also a name given to some lycopods or club-mosses.

Ground-rent, is the rent paid to a landowner by a person for the use of ground on which buildings are erected. The usual arrangement is for a specified time. In the United States a ground-rent deed is usually drawn for a term of years, mentioning the consideration-money on which interest is payable.

Groundsel (ground'sel; *Senecio vulgaris*), a European weed belonging to the nat. order Compositæ. The plant is emollient, has a slightly acid taste, but is rejected by almost every quadruped except the hog and goat; cage-birds are fond of the seeds. The Golden Senecio is an American species.

Ground Squirrel, the name of squirrels of the genus *Tamias*, somewhat resembling the marmot. They differ from the common squirrel in possessing cheek-pouches, and in retreating into burrows. They are well known in America, but species are also found in Asia and Africa.

Group Insurance. A new form of mutual social benefit, recently come into use. It is a sort of outgrowth of the workmen's compensation acts, which it has closely followed. The first compensation act was the Federal law of 1908, and the first State act to go into force was the New Jersey one of 1911, while group insurance in America began in 1912. Social insurance was needed in cases where the compensation laws were not operative, as in the case of those dependent on artisans. Some insurance companies are inclined to believe that this form of insurance is likely to take as strong a hold as the compensation laws, and policies of this kind have been bought by some employers on a large scale and presented to their workmen as a way of showing their good will. By the taking out of group insurance, rates may be much reduced as the need of agents is diminished. In an insured group men with slight ailments will be included with those perfectly sound, the insurance companies being confident that men seriously diseased will not be taken into a group. Most group insurance is offered either in the form of single life insurance or with more elaborate policies, as life insurance disability provision, annuities for declining years, etc. We find much larger co-operative insurance bodies abroad than in this country, where there are the Sociétés de Secours Mutuèl which have enrolled over 4,000,000 people in France and a half million in Belgium. Here workmen of foreign birth are too much inclined to change employment, but the introduction of group insurance has tended to check this habit.

Grouse (grous), the general name of the gallinaceous birds of the family Tetraonidæ, whose distinguishing mark is a naked band, often of a red color, in place of an eyebrow. They are wild, shy, and almost untamable. They live in families, in forests and barren regions, and feed on berries, buds, and leaves. They are polygamous, the male abandoning the female, and leaving to her the whole care of the progeny. The eggs number eight to fourteen. The largest species is the *capercailzie* or *wood grouse*. (See *Capercailzie*.) Other species are the black grouse, the red grouse, commonly called simply the grouse, and the white grouse or ptarmigan. The black grouse (*Tetrão tetrix*) is about the size of a common fowl. The male has the outer feathers of the tail curved outwards, so that the tail is lyre-shaped. It chiefly lives in high and wooded situations, feeding on various kinds of berries. The female is commonly called *gray hen*. To this genus belong several species peculiar to North America, the most remarkable of which is the *pinnated grouse* or prairie hen (*T. cupido*), which inhabits open desert plains in particular districts of the United States. The male is furnished with wing-like appendages to his neck, covering two

loose, orange sacs, capable of being inflated. Another species is the *cock of the plains* (which see). The grouse with hairy feet and which undergo seasonal change of plumage form the genus *Lagópus*. Of these the *red grouse* (*Lagópus scoticus*) is the most important. This bird, also called *moorfowl*, is found in great plenty in the Highlands of Scotland, also in Wales, the north of England, Ireland, and the Scottish islands. It pairs in the spring; the female lays eight or ten eggs. As soon as the young have attained their full size they unite in flocks of forty or fifty, and are extremely shy and wild. This bird attracts large numbers of sportsmen every August to the Scottish moors to take part in the grand sporting campaign which follows the twelfth. The *ptarmigan* or *white grouse* (*Lagópus mutus* or *vulgáris*) is ash-colored in summer, but its hue changes to a pure white in winter. It is found in Scotland and in most northern regions, inhabiting the tops of mountains. See also *Hazel Grouse*, *Ruffed Grouse*, *Sand Grouse*.

Grove (grōv), Sir George, an English writer, born in 1820; died in 1900. He was educated as a civil engineer, in which capacity he was connected with the Britannia Bridge and other important works. He was long secretary to the Crystal Palace Co., and did much for the popularizing of classical music in connection with its concerts. For some years he edited *Macmillan's Magazine*, and he was editor of, and a contributor to, the great *Dictionary of Music*, published in 1878-1889. He was also an extensive contributor to Smith's *Dictionary of the Bible*. He was knighted in 1883.

Grove, Sir William Robert, physicist, born at Swansea, Wales, in 1811; died at London in 1896. He was graduated from Oxford in 1835 and became successful as a lawyer, meanwhile devoting himself to the study of physical science, in which he made important discoveries. About 1839 he invented the useful nitric-acid voltaic battery which bears his name. He was among the first to maintain the theory that heat, light, and electricity are mutually convertible, and that heat is a mode of motion. He developed this theory in his *Correlation of Physical Forces*.

Grow (grō), Galusha A., statesman, was born in Windham County, Connecticut, in 1824, removing to Pennsylvania in 1834. In 1850 he was elected to Congress, serving for twelve years, and was elected Speaker of the House in 1861. He rendered important services in Congress, and was a strong advocate of the Homestead bill. He returned to Congress in 1894, and died in 1907.

Grub, the term applied to the soft, wormlike larvæ of coleopterous and other insects. Some species do much injury to the roots of plants, growing corn, etc.

Grünberg (grün'berh), a town in the Prussian government of Liegnitz, Silesia, surrounded by vineyards, which produce large quantities of wine. Pop. 23,162.

Grundtvig (grön'vig), Nikolai Frederik Severin (1783–1872), Danish poet and theologian, born at Udby, in Zealand, became known as the author of *Northern Mythology* (1808) and *Decline of the Heroic Age in the North* (1809). These were followed by the *Rhyme of Roeskilde*, the *Roeskilde Saga*, and patriotic songs. He became the head of a religious school, the Grundtvigians, who strove to free the church from the interference of the state. From 1839 Grundtvig preached in the Church of Vartov Hospital in Copenhagen; after 1861 with the title of bishop. His son published his *Poetiske Skrifter* (6 vols.) in 1880–85.

Grundy, Mrs., an imaginative character in the English comedy *Speed the Plough*, in which *Dame Ashfield* is troubled about the opinion of her neighbor on some topic and asks anxiously, 'What will Mrs. Grundy say?' Since then Mrs. Grundy represents the general opinion of the public on any mooted question, and is a synonym for common gossip.

Grunt, Grunter, an American fish of the family Hæmulonidæ, also termed *pig-fish* and *red-mouth*. The first of these names relates to the sound it emits when taken out of the water, the last to blood-red marks on the gums or lips. The Growler, found in America, also emits a grunting sound.

Gruyère (grü-yār), a village, Switzerland, canton and 16 miles south of Fribourg, on a hill crowned by a fine old feudal castle. It gives its name to the well-known cheese made from a mixture of goats' and ewes' milk. It is firm and dry, and possesses cells of considerable magnitude.

Gryllus (gril'us), a genus of orthopterous insects, embracing the house and field crickets, though some also include in it the grasshopper.

Grysbok (gris'bok, 'grey buck'; *Antilope melanótis*, or *Calotragus melanótis*), a species of antelope found in Southern Africa. It attains about 3 feet in length, is 1½ feet high at the shoulder, and its color is reddish-

grey. It is hunted for the sake of its flesh.

Guacharo (gwä-chä'rō; *Steatornis Caripensis*), a bird of the goat-sucker family, of nocturnal habits, a native of South America, and found in great numbers in certain caves of Venezuela, Trinidad, and elsewhere. It is about the size of a common fowl, with a curved and toothed bill, wings long and pointed. Their food is principally fruits, upon which they grow so fat that the Indians destroy great numbers for the sake of their oil or clarified fat, which is transparent, inodorous, and keeps long without becoming rancid. It is called also *Oil-bird*.

Guadalajara (gwä-dä-lä-hä'rä), a town of Spain, capital of the province of same name, on the Henares, 44 miles northeast of Madrid. It is substantially built, with manufactures of woolens, soap, earthenware, etc. Pop. 11,144.—The province, area 4676 square miles, is mountainous, or rather forms part of an elevated plateau. Pop. 200,186.

Guadalajara, a city of Mexico, capital of the state of Jalisco, in the fruitful valley of Atemajac, on the Rio de Santiago; a large and handsome city, with a fine cathedral (being an archbishop's see), and other good buildings; a university, a mint, convents, etc. Various manufactures are carried on, as those of silversmiths' and goldsmiths' wares, paper, leather, hats, pottery, cloth, etc. Pop. 101,208.

Guadalquivir (ga-dal-kwiv'ėr; Span., gwä-dal-kē-vėr'), a river of Spain, which rises in the frontiers of Murcia, traverses Andalusia from northeast to southwest, passing the towns of Cordova and Seville, and thereafter flowing s. s. w., falls into the Atlantic. Its course is 250 miles, of which 70 miles are navigable. It abounds with fish.

Guadeloupe (ga-de-lōp), one of the French West Indies, composed of two portions, separated by a narrow arm of the sea called Rivière Salée (salt river). The western and larger portion is Basse-terre, or Guadeloupe proper, 27 miles long by about 15 miles broad. The eastern portion, called Grande-terre, is nearly 30 miles long by 10 to 12 miles broad. Guadeloupe proper is of volcanic formation, the culminating point being La Soufrière, 5018 feet. Grande-terre, on the other hand, is generally flat, and of coral formation. Guadeloupe is watered by a number of small streams which become dry in summer. Grande-terre has only a few springs of brackish, undrinkable water. The climate is hot and unhealthy, with a remarkably humid atmosphere, and hurricanes are frequent and destructive. The soil is fertile. The chief exports are sugar, coffee, dye and cabinet woods, pepper, manioc, tobacco, etc. The chief town is Basse-terre. Pop. 134,000, or with dependencies (Marie Galante, Desirade, etc.), 182,112.

Guadiana (gwä-di-ä'nä), a river of Spain, which rises in New Castile, flows first northwest, then southwest into Estremadura, and on reaching Badajos begins to form part of the boundary between Spain and Portugal. Entering that kingdom, it finally falls into the Atlantic after a course of 400 miles, of which only 35 are navigable.

Guadix (gwä-dėh'), a town of Southern Spain, Andalusia, in the province and 31 miles E. N. E. of Granada. Said to be the first bishop's see erected in Spain, with a handsome cathedral, and a finely situated old castle, almost in ruins. Pop. 11,300.

Guaduas (gwä'dwäs), a town, republic of Colombia, remarkable as being one of the most elevated places on the globe, being 8700 feet above sea-level. Pop. 9000.

Guaiacum (gwī'a-kum), a genus of plants, belonging to the natural order *Zygophyllaceæ*, and containing four or five arborescent species, natives of the West Indies and the tropical parts of America. *G. officinale* has wood that is exceedingly hard, of a pale yellow color near the exterior, and blackish brown at the heart, heavier than water, and well known under the name of *lignum vitæ*. Among other uses it is employed in the construction of ornamental articles of furniture, being susceptible of a fine polish. This tree yields the resin known as guaiacum, which either flows spontaneously from the tree, or from incisions or perforations in the stem, or is got by extraction by means of spirit from the wood. It is greenish-brown, has a balsamic odor, taste somewhat bitter and pungent, and it dissolves freely in spirit, but is insoluble in water. Its chief use is in medicine, the resin (as well as a decoction of the bark and wood) acting as a stimulant in chronic rheume-

Guaiacum Plant (*Guaiacum officinale*).

tism, and being used also in gout, scrofula, syphilis, etc.

Gualeguay (gwäl'e-gwī), a town of the Argentine Republic, prov. Entre Rios, on river of same name. Pop. 9000.

Gualegwaychu (g w ä-l e-gwī-chō'), a town of the Argentine Republic. Pop. 15,000.

Guam (gwäm), GUAHAN, GUAJAN or SAN JUAN, the largest of the Ladrone Islands, acquired from Spain by the United States after the Spanish-American war. It lies in the North Pacific Ocean, lat. 13° 30′ N., long. 145° E. It has an area of about 200 square miles, is mountainous in the south; low and of coral formation in the north. The chief ports are Agana (the capital) and San Luis de Apra. The island is well wooded, the soil, fertile. Bread-fruit, cocoanut, rice, sugar and indigo are cultivated. Pop. about 13,000.

Guan (gō'an), a gallinaceous bird of the family Cracidæ, genus *Penelopē*. The sides of the head and front of the throat are naked and wattled. The guans are natives of South America.

Guanabacoa (g w ä'n ä-b ä-k ō'ä), a town of Cuba, lying in a small fertile plain among rocky hills, five miles east of Havana. Pop. about 15,000.

Guanaco (gwän-ä'kō), *Auchenia huanacus*, a South American ruminant, closely akin to the llama, alpaca, etc. It is believed to have been the progenitor of the domesticated llama and alpaca.

Guanajay (gwä-nä-hī), a town of Pinar del Rio province, Cuba, 33 miles w. s. w. of Havana and a few miles from the coast. Pop. 10,000.

Guanajuato (g w ä-n ä-*n* w ä't ō), a city of Mexico, capital of the state of the same name, 160 miles northwest of Mexico, is situated in a narrow defile, hemmed in by mountains, at the height of 6800 feet above the sea, with steep irregular streets, but well-built houses. Pop. 35,147.—The state is situated in the center of Mexico; area, 11,411 square miles; pop. (1910), 1,075,270. Its mines, once the richest in the world, still yield a large amount of gold and silver. The surface is traversed by the Cordillera of Anahuac, 7000 feet high.

Guanches (gu-an'ches), the aborigines of the Canary Islands, long ago extinct as a separate nation, although Guanche blood probably flows in the veins of many of the present inhabitants. They possessed high moral and physical qualities. They practised the embalming of the dead. The few words of their language which remain seem cognate to the Berber tongue.

Guano (gwa'-nō; Peruvian *huano*, dung), a valuable manure, consisting of the partially decomposed and dry excrement of fish-eating sea-birds, which has in some places accumulated in great masses. The name has been also extended to accumulations of a similar kind from land birds, and even from bats in caverns. Owing to the fact that rain washes such deposits away, great accumulations of guano exist principally in hot and dry tropical regions. The most important of all were the deposits on the Chincha Islands off the coast of Peru, which yielded a considerable revenue to the country, but are now quite exhausted. From 1853 to 1872 about 8,000,000 tons were got from these islands. The guano which was found there was from 60 to 80 or 100 ft. in thickness, and was entirely due to the droppings, accumulated for many ages, of the innumerable sea-birds which make these islands their resting-place and breeding-ground. Other deposits of less extent have from time to time been found, and Peru still remains the chief source of supply, its deposits being now, however, worked under the Chilean government. Guano varies extremely in composition, but it may be roughly divided into nitrogenous and phosphatic. The first of these contains about 21 per cent. of ammonia. This is the case with the Peruvian variety, which contains almost all the inorganic matter required by a plant, and that in a highly available form, so that it is looked upon as one of the best of all fertilizing agents for different crops. Its use as a manure was known to the native Peruvians centuries ago, but no attention was paid to the accounts by modern travellers of its wonderful efficacy until A. von Humboldt brought some to Europe and had it analyzed. It began to be brought to Europe about 1846. It is used raw or in its natural state, but most of the phosphatic guanos (some of which hardly deserve the name of guano) require to be dissolved by sulphuric acid before using. There are also manures known as *fish guano*, prepared from fish or fish refuse, *flesh guano*, *blood guano*, etc. Large quantities of fish guano are made in the United States, the menhaden being the fish used, and the oil being extracted before the fish are ready for conversion into manure. Fish guano is also at the present time largely made in Europe. It is an excellent substitute for the natural guano.

Guantanamo (gwän-tä'nä-mō), or SANTA CATALINA DEL SALTADERO, a town of Santiago de Cuba province, Cuba, 38 miles E. N. E. of Santiago de Cuba (direct). It has railroad connection with the sea and is in the midst of an extensive coffee-growing district. Guantanamo Bay is an American naval station. Pop. about 8000.

Guapore (gwä-pō'rā), or ITENEZ, a river of South America, which rises in the Brazilian province of Matto Grosso, and after a varied course of about 500 miles, unites with the Mamoré in forming the Madeira.

Guarana (gwä-rä'nä), or BRAZILIAN COCOA, the seeds of the *Paullinia sorbilis*, a South American tree. It is extensively used as a beverage and contains twice as large a proportion of caffeine as coffee.

Guarani (gwä-rä-nē'), tribe of aborigines, once spread widely through central and southern Brasil, Paraguay, Bolivia, Argentina, and Uruguay. Their migratory movements, the most widespread among South American aborigines, were peaceful, and, including the kindred Tupi, they may be said to have comprised the major part of the eastern Amazons.

Guarantee (gar-an-tē'), in law, an undertaking by which a person binds himself to answer for the failure of another. In the United States no person is liable on any special promise to answer for the debt, default, or miscarriage of another person, unless a written agreement, or some memorandum in writing for such purpose, shall be signed by the promiser or some other party lawfully authorized by him. It is a general rule that the surety shall not be bound beyond the express words of the engagement.

Guardafui (gwär-dä-fwē'), CAPE, or RAS JERDAFOON, the most Eastern point of Africa, at the entrance of the Gulf of Aden, a frequent scene of shipwreck.

Guardian (gar'dyan), in law, the custodian of persons incapable of directing themselves, and especially of infants, that is, persons under 21 years of age. He is entitled to the care and custody of the person of his ward. If he spends more than the interests and profits of the estate in the maintenance and education of the ward, without permission of court he may be held liable for the principal thus consumed. Guardianship lasts until the ward has attained the age of twenty-one. Trust companies have now largely entered into the business of guardianship, a custom which adds greatly to the safety with which estates are handled.

Guardian Angel, the angelic guardian who, by some, is supposed to watch over every human being with a view of preserving him or her from moral evil. The notion is based on Gen. xlviii, 16; Matt. xviii, 10, and Heb. i, 14.

Guardians of the Poor, in England, persons elected by a parish or union to manage the affairs of the poor. Each ratepayer has one or more votes in proportion to his property, the maximum being twelve. The guardians have the management of the workhouse, and the maintenance, clothing, and relief of the poor.

Guards (gards), troops whose duty is to defend the person of a ruler. In modern times the term *guard* has been used to designate corps distinguished from the troops of the line by superior character, or only by rank and dress. Among the most famous guards were those of the rulers of France. The Scottish Guards of Charles VII (see *Garde Ecossaise*) and the Swiss Guards (see *Gardes Suisses*), enrolled by Louis XIV, have acquired historical importance. Under the latter monarch the Royal Guard amounted to 10,000 men. In 1789, when the revolution began, all the branches of the guards amounted to about 8000 men. The Imperial Guard was formed by Napoleon I in 1804, and in 1812 it amounted to 56,000 men. His guards were almost completely annihilated at Waterloo. The Imperial Guard was revived by Napoleon III in 1854, and took part in the Crimean war; but in the Franco-German war of 1870-71 its career was closed at the surrender of Metz. The guards of Frederick the Great of Prussia were of distinguished courage and remarkable height. The German guard now forms a complete army corps, and one of the finest bodies of troops in Europe. In England the guards, otherwise called the household troops, consist of the Life Guards (1st and 2d), the Royal Regiment of Horse Guards, and three regiments of foot guards, namely, the Grenadier Guards, the Coldstream Guards, and the Scots Fusilier Guards. The 1st and 2d Life Guards, and the Royal Horse Guards stand at the head of the cavalry of the country as the three regiments of foot guards do of the infantry. In time of peace they constitute the garrison of London and the guard of the sovereign at Windsor.

Guard-ship, a vessel of war appointed to superintend the marine affairs in a harbor, and to visit every night the ships of war which are not commissioned; she also acts as a depot for seamen raised in the port until appropriated to other vessels.

Guarini (gwä-rē'nē), GIOVANNI BATTISTA, an Italian poet, was born at Ferrara in 1537; and died in 1612. After having studied at Ferrara, Pisa, and Padua, and lectured in his native city on Aristotle, he entered the service of Duke Alphonso II of Ferrara, who sent him on various important missions. Having lost the favor of the prince, he retired into private life, but was recalled in 1585 to the office of secretary of state. Two years after he retired a second time. In 1597 he entered the service of Ferdinand I, grand-duke of Tuscany, which he soon quitted. His propensity to litigiousness necessitated his residence at Venice, Padua, and Rome. In 1605 he went as an ambassador of his native city to the court of Rome, to congratulate Paul V on his elevation. He died at Venice. Guarini is one of the most elegant authors of Italy, as is especially shown in his *Pastor Fido* ('Faithful Shepherd'), a famous pastoral drama.

Guarneri (gwär-nā'rē), the name of an Italian family belonging to Cremona, distinguished for its skill in violin-making. The most celebrated of the family was Giuseppe, whose best instruments belong to the years 1690-1707.

Guastalla (gwäs-täl'lä), a small town of N. Italy, near the Po, which, in the sixteenth century, gave its name to the dominion of the Gonzagas, dukes of Mantua.

Guatemala (gwä-te-mä'lä), a republic of Central America; area estimated at 48,290 square miles; population, 2,119,000. It is in general exceedingly picturesque, and distinguished by a luxuriant and varied vegetation. It is wholly mountainous or elevated, the main chain of the continuation of the Andes traversing it southeast to northwest, and sending off numerous branches. Along the main chain are a considerable number of volcanoes, several of which are said to be active—as Fuego and Agua (14,890 feet high), which sends forth torrents of water. The state is well watered by numerous streams, none of much importance. There are several lakes, the most important being Dulce, through which a great part of the foreign trade of the state is carried on; Amatitlan, Atitlan, and Peten. On the tableland, of which a considerable portion of the state is formed, the climate is mild; but in more elevated situations the cold is intense. There is much valuable timber. The soil generally is of great fertility, producing according to altitude, soil, etc., maize, wheat, rice, coffee, cotton, tobacco, sugar, cochineal, cacao, indigo, vegetables, and tropical fruits in great variety. Fibre plants are numerous, including ramie, henequen, and others. The most important product is coffee, and the other chief exports are skins, caoutchouc, cochineal, wool, etc. The trade is chiefly carried on with Britain and the United States. In the *altos* or mountainous parts of the northwest considerable flocks of sheep are raised, the wool of which is manufactured into coarse fabrics. But the manufacturing industries are very insignificant, and trade is hindered by the paucity of roads and railways. Only about a third of the population are of European or mixed descent, the rest being Indians of the Aztec, Toltec or Maya races, mostly speaking their own native tongue. Numbers of the Indians are still quite uncivilized. Great attention is now being paid to education, the children, even Indians, in small and remote villages being compelled to attend school. The capital is Guatemala la Nueva (New Guatemala). The chief port is San José on the Pacific; Champerico on the Pacific, and Livingston in the Bay of Honduras are the other ports. The legislative power is vested in a national assembly elected for six years by universal suffrage. The executive is vested in a president, elected for four years. GUATEMALA CITY, the capital of the republic, is situated about 5000 feet above the sea and had a population of 120,000 in 1916. It was almost completely destroyed by a series of earthquakes that occurred in December, 1917, and January, 1918. The first capital of the country—now known as Ciudad Viega—was overwhelmed by a volcanic eruption in 1556. The second capital, Guatemala la Antigua, was situated about 25 miles west of the present capital. It was destroyed by an earthquake shock in 1774, but was rebuilt and now has a population of about 7000. It is locally celebrated for its thermal springs.

Guava (gwä'va), the popular name for plants of the tropical genus *Psidium* of the nat. order Myrtaceæ. *P. Guajava* (the guava tree) is a small tree, with square branches, egg-shaped leaves, and large white axillary flowers, which are succeeded by fleshy berries, which are either apple or pear shaped in the two principal varieties. The pulp is of an agreeable flavor, and

of this fruit is made a delicious and well-known jelly. There is also a product called guava cheese.

Guaviare (gwä-vi-ä'rä), a river of Colombia, an affluent of the Orinoco; length, 900 miles.

Guayaquil (gwi-ä-kēl'), a city and seaport of Ecuador, on the Guayaquil, here about 2 miles wide, some 40 miles above its mouth in the Gulf of Guayaquil. Behind the town is an extensive marsh, which renders it unhealthy. There is also a deficiency of water, but the town is improving, and has already street cars and telephones. It is the chief port of Ecuador, and one of the best on the west coast of South America. Its principal exports are cacao (to the value sometimes of $5,000,000), coffee and ivory-nuts. Pop. estimated at 80,000.

Guayra (gwī'rä), La, a seaport in Venezuela, closely surrounded by mountains and precipices. It carries on a considerable trade, and exports coffee, cacao, etc. Pop. about 12,000.

Gubbio (gub'i-ō; ancient *Iguvium*), a town in I[illegible] in the province of Umbria. It is a [illegible]op's see, and has manufactures of silk [illegible]d woolen stuffs. Here were discovered the Eugubine Tables (which see) in 1444. Pop. 5540.

Guben (gö'ben), a town in Prussia, province of Brandenburg. Brewing, dyeing, and tanning are carried on, and there are manufactures of woolen and linen cloth, tobacco, etc. Pop. 36,666.

Gudgeon (guj'un; *Gobio*), a fresh-water fish, belonging to the carp family (Cyprinidæ). It has short dorsal and anal fins, without spines; on each side of the mouth there is a small barbel; neither jaw is furnished with teeth, but, at the entrance of the throat, there are two triangular bones that perform the office of grinders. These fish are taken in gentle streams, and measure only about 6 inches.

Gudrun (gud'run), a celebrated German popular epic belonging to the end of the twelfth century, receiving its name from its heroine Gudrun, daughter of King Hettel of Hegelingen. Hettel is defeated by Hartmut, son of King Louis of Normandy, who carries Gudrun off, and on her steadfast refusal to marry him, has her subjected to various kinds of ill treatment, and in particular lets his mother keep her for years engaged in the lowest kinds of drudgery. At last she is released and revenged by her brother and her betrothed, King Herwig of Seeland. The poem also deals with the fortunes of Gudrun's father and mother, grandfather and grandmother, etc., and the scene is partly in North Germany, Denmark, Friesland, partly in Ireland and Normandy.

Guebres, Gueb'res (gā'bers), a name given to the fire-worshippers of Persia, represented in India by the Parsees. The original Guebres or followers of Zoroaster are now represented almost solely by those who inhabit the cities of Yesd and Kirman and the adjoining villages. At present they number only about 7000. As supreme deity they recognise Ahuramasda, or Ormusd, the principle of light and source of all that is good; and his opposite and antagonist, the evil principle, the latter called Ahriman. They believe in the existence of heaven and hell, between which stretches the Bridge of the Gatherer or Judge; over this none but the righteous may pass. Among their leading practices may be mentioned their refusal to contract marriages with those of other creeds; their objection to eat beef or pork, or to partake of anything cooked by one of another religion, etc. They regard Ahuramasda as the source of light, and in their temples they feed the altars with perpetual fire, and hence their name fire-worshippers; but they do not revere it except as a symbol of [illegible]ity. When, in 651 A. D., Yesdegird, [illegible] last of the Sassanides, was defeated by the Caliph Omar, the majority of the Persians embraced Islamism. Those who continued Zoroastrians received the name of Guebres or infidels, and were subjected to persecutions so severe that the majority emigrated to India, where they became known as Parsees. See *Parsees*.

Guelderland (gel'dėr-lant). See *Gelderland*.

Guelder Rose (g[illegible]'der), or Gueldres Rose, a name given to the cultivated variety of the *Viburnum Opulus*, or [illegible]er elder, of the order Caprifoliaceæ. On account of the shape and color of its flowers it is sometimes called the Snowball Tree. Its fruit is of a pretty red color.

Guelf (gwelf), or Guelph, the name of a distinguished princely family which originated in Germany, but was also at one time connected with Italy, and which still flourishes in the two lines of the house of Brunswick, the royal (to which the reigning family in Britain belongs) and the ducal. The first who bore the name is said to have been Welf, the son of Isenbrand, whose grandfather was a vassal of Charlemagne. See *Brunswick* (Family of) and *Guelfs and Ghibellines*.

Guelfs and Ghibellines, names of two great Italian political parties in the 13th and 14th centuries. The names are derived from the Italian *Guelfi* and *Ghibellini*, which are corrupted from the German *Welfen* and *Waiblingen*. These latter words came to be used as party designations in Germany, in the war between Henry the Proud and Conrad of Hohenstaufen, to whom belonged the estate of Waiblingen in Würtemberg. About the year 1200 the designations Guelf and Ghibelline came to be employed to denote respectively the Italian patriotic and papal party, and the party which supported the domination of the German emperors in Italy. After the fall of the Hohenstaufen the Ghibellines became the partisans of aristocracy, and the Guelfs the partisans of democracy and liberty; but the designations ultimately denoted mere communal and family feuds, and Dante, originally a Guelf, but subsequently a Ghibelline, asserted that the two parties were the cause of all the miseries of Italy. The contest continued with bitterness for almost three hundred years. Corresponding parties appeared in Italy under many different names, as the *bianchi* and *neri* (white and black) in Florence, etc.

Guelph (gwelf), a town of Canada, province Ontario, in a rich farming district, 45 miles W. of Toronto, with manufactures of woolens, sewing-machines, and agricultural implements, and a model farm kept up by the provincial government. Pop. (1911) 15,148.

Guercino (gwer-chē'nō). See *Barbieri*.

Guereza, or GUENZA (ger'e-za, ger'-za; *Colobus guereza*), a species of monkey remarkable for its beauty, inhabiting the mountains of Abyssinia. Short, glossy, jet-black fur covers its limbs, back, and head, while a long fringe of silky white hair depends from the flanks. It frequents lofty trees.

Guericke (ger'ik-e), OTTO VON, a German physicist, born at Magdeburg (of which he became burgomaster or mayor) in 1602; died at Hamburg in 1686. About 1650 he invented the air-pump, with which he made public experiments at the diet at Ratisbon, before the Emperor Ferdinand III. His most important observations, collected by himself, appeared at Amsterdam in folio (in 1672).

Guérin (gā-ran), JEAN BAPTISTE PAULIN, a French painter, born at Toulon in 1783; died at Paris in 1855. He painted portraits and historical subjects. His chief pictures are the following: *Cain After the Death of Abel, The Dead Christ, Adam and Eve Driven Out of Paradise, Anne of Austria and Her Sons*, etc.

Guernsey (gėrn'zi), the second largest and most western of the Channel Islands, lying off the north coast of France, 46 miles from Cherbourg, and about 68 miles from Start Point in Devonshire. It is of a triangular form, about 9 miles long, and 3 to 4 miles broad. The northern part is level, the southern more elevated, coast lofty and abrupt, the island being almost entirely of granite formation. The climate is extremely healthy; snow is rare, and frosts light and of short continuance. The soil is fertile. The breeding of cattle and the dairy are the principal objects of attention; and the butter made is highly esteemed. Horticulture and floriculture also receive much attention, and fruit, especially figs and grapes (the latter grown under glass), is very abundant. The grape-houses are further utilised for the raising of early vegetables and tomatoes, which are sent to the London market. The principal exports are cattle (the dairy cows being renowned), fruits, vegetables in the early spring; granite for paving, etc. The dialect of the island is the pure Norman of some centuries ago; but a knowledge of English is general. The principal place of education is Elizabeth College, at St. Peter's Port, the capital, and only town in the island. Steamers ply regularly between Guernsey and London, Southampton, Plymouth, and Weymouth. The island is under a lieutenant-governor, who represents the sovereign in the assembly of the states, a kind of local parliament. It is strongly fortified, and has a well-organised militia. Pop. 40,477. See *Channel Islands*.

Guernsey Lily, *Nerine Sarniensis*, a beautiful plant, with purple red flowers, native of South Africa, family Amaryllidaceæ, so called from some of its bulbs being cast up in Guernsey from a wrecked ship and there taking root. There are several other species also called Guernsey lilies.

Guerrero (ger-rā'rō), a state of Mexico; area, 24,227 sq. miles. Its surface is finely diversified by mountain and valley, and partly covered by native forests; and it is rich in minerals, including gold, silver, copper, and iron. The principal port is Acapulco. Pop. 479,205, mostly Indians.

Guerrillas (ge-ril'as; in Spanish ge-ril'yās), a name first given in Spain to light, irregular troops, consisting chiefly of peasants who fought against the invading French in the early

part of the present century. The name has now become quite a general term for such irregular troops, and has traveled far beyond Spain, reaching pretty much the entire world.

Guesclin, BERTRAND DU. See *Du Guesclin.*

Gueux (geu; Fr. 'beggars'), a name given in derision to the allied nobles and other malcontents in the Netherlands, who resisted the despotism of Philip II, in 1566-67. The Count of Barlaimont having termed the malcontents *Gueux*, they adopted the name, and a suitable badge called the 'beggar's denier.' They were totally dispersed in 1567.

Guevara y Dueñas (gā-vā'rà ē dụ-en'yàs), LUIS VELEZ DE, a Spanish dramatic poet, born in 1570; died in 1644. His literary fame rests chiefly on his *Diablo Cojuelo* ('Lame Devil'), which suggested the famous *Diable Boiteux* of Le Sage.

Guglielmi (gụl-yel'mē), PIETRO, an Italian composer, born 1727; died 1804. He composed comic and heroic operas for the Italian theatre, visited Vienna, Madrid, and London, and afterwards returned to Naples, where he became the rival of Paesiello. In 1798 Pius VI named him chapel-master of St. Peter's. He left more than 200 pieces, remarkable for their simple and beautiful airs, their rich harmony, and their spirit and originality.

Guiana (gī-an'a), BRITISH, a colony in the north of South America, about 580 miles long and 200 miles broad, bounded E. by Dutch Guiana, W. by Venezuela and Brazil, N. and N. E. by the Atlantic, and S. by Brazil; estimated area, 109,000 sq. miles. It is divided into three settlements—Berbice, Demerara, and Essequibo. The coast tract forms a dreary belt, 10 to 40 miles broad, of mud-banks and shallows, and when drained the surface sinks 1 foot below the sea-level, hence strict attention must be paid to dams and sluices. This alluvial deposit is succeeded by a range of low hills not exceeding 200 feet in height. The interior is traversed in various directions by chains of hills or mountains. On the western boundary is the singular flat-topped and almost inaccessible mountain Roraima, rising to a height of 8600 feet. The remaining mountains do not reach more than 4000 feet elevation. The most valuable mineral product is gold, the mining of which has been active since 1886. Diamonds are also found. The chief rivers are the Essequibo, Demerara, Berbice, and Corentyn. The climate, though moist and warm, is not on the whole unhealthy. Cultivation is confined to the coast region; the soil is very fertile, and much of it well adapted for the sugar-cane, the cultivation of which is mostly carried on by Indian and Chinese coolies. Guiana also produces coffee, tobacco, indigo, etc. Vegetation is singularly luxuriant, and the forest-trees are of the most

Indians of Guiana.

magnificent description. Fruits, medicinal plants, fibrous vegetables, dyeing woods, etc., abound. The flora includes the *Victoria Regia*, the largest of the water-lilies. Among the animals are the jaguar, tapir, armadillo, sloth, vampire bat, alligator, etc., and many species of birds, such as humming-birds, parrots, etc. Snakes, some of them venomous, and troublesome insects are numerous. Guiana has two dry and two wet seasons, each continuing for three months: December, January, February, June, July, and August, constitute the wet season, the other months of the year the dry. The mean annual temperature is nearly 81° 2'. Violent thunderstorms occur at the change of the seasons; but the hurricanes, so destructive in the West Indies, are unknown. The trade is concentrated mainly in Georgetown, the capital. Sugar, rum, and molasses are the principal exports. Guiana was first settled by the Dutch about 1620. It was taken by the British in 1783, in 1796, and again in 1803, and later it was definitively given up to them. Pop. 301,923; a great proportion being of African race or coolies from India.

Guiana, DUTCH, or SURINAM, a Dutch colony in South America, situated between English and French Guiana; area, about 46,060 sq. miles. The general aspect is the same with that of British Guiana—flat and

swampy on the coast, and mountainous in the interior; well watered by numerous streams, and of which the Surinam and its affluents are the chief. It has also a similarly warm, moist climate, and is very fertile. Only a small part of the colony is under cultivation, the products being similar to those of British Guiana. On the Surinam River, about 10 miles from its mouth, is situated the capital, Paramaribo. The principal exports are sugar, coffee, molasses, and rum. The gold washings are of considerable value and crushing plants have been introduced. The government is vested in a governor-general and council. Pop. 84,103.

Guiana, FRENCH, a French colony in South America, between Dutch Guiana and Brazil; area, about 35,000 square miles. This territory resembles British Guiana in its physical features, climate, and vegetable productions, with the addition, in the latter case, of pepper, cloves, cinnamon, nutmeg, etc. The colony comprises the island of Cayenne, celebrated for the pepper bearing that name. Gold has also been found in considerable quantities, and of late gold washing has been the chief industry and has proved very profitable, the annual yield being nearly $2,500,000. The French are said to have first settled in Cayenne in 1604. Pop. 32,908.

Guiana Bark, the bark of *Portlandia hexandra*, order Cinchonaceæ, considered to possess great value as a febrifuge.

Guicciardini (gwē-chär-dē'nē), FRANCESCO, an Italian historian, born at Florence in 1482; died in 1540. He became professor of jurisprudence at Florence, and held various public appointments. He began in 1534 his famous History of Italy—*Dell' Istoria d' Italia*—which embraces the period 1490-1534. It has been translated into English.

Guicowar's Dominion (gī-ko-wär'). See *Baroda*.

Guides (gīdz), in an army, persons selected for their acquaintance with the topography of the place in which the army operates, and employed to conduct the army or detachments of it to any place which has to be reached. The name of 'guides' is sometimes given to troops without any very specific meaning. In the Indian army it is given to a regiment of cavalry and infantry attached to the Punjab Frontier Force.

Guido Aretino (gwē'dō à-re-tē'nō), or GUIDO D' AREZZO, an Italian monk, celebrated for his skill in music, flourished in the eleventh century. He was a native of Arezzo, became a Benedictine monk, and finally prior of Avellana, where he died in 1050. He invented the musical staff of lines and spaces (or at least systematized their use), and he introduced the names of the first six notes of the scale, *ut, re, mi, fa, sol, le.*

Guidon (gī'don), the little flag or standard of a troop of cavalry.

Guido Reni (gwē'dō rā'nē), a celebrated Italian painter, born at Bologna in 1575; died there in 1642. Being the son of a musician, he devoted some time to the study of music, but, as painting seemed his true vocation, he was placed under the tuition of Dionysius Calvaert, and subsequently joined, in his twentieth year, the school of the Caracci. In 1602 he visited Rome, and having seen the paintings of Caravaggio, he imitated his style. At the request of Cardinal Borghese he painted *The Crucifixion of St. Peter* and the *Aurora*. He was also employed by Paul V to paint a chapel on Monte Cavallo, and one in Santa Maria-Maggiore. Guido's paintings are generally considered as belonging to three different periods. His earliest pictures, after the style of Caravaggio and Caracci, display powerful contrasts of light and shade. His second manner exhibits light and agreeable coloring, with little shade. His third period is marked by careless haste. Having quarreled with Cardinal Spinola, the treasurer of Urban VIII, he left Rome and returned to Bologna, but was subsequently recalled. In 1622 he removed to Naples, but, after a brief stay, returned once more to Bologna, never to leave it again. Among his most famous works may be mentioned his *Aurora*, his *Magdalene*, *Michael Vanquishing Satan*, *Lot and his Daughters*, his *Fortune*, etc. Guido was also celebrated in his own day for his etchings, but his works of this class have now sunk very much in value.

Guienne, or GUYENNE (gē-en'), an ancient province of France, now comprising the departments of Gironde, Lot, Lot-et-Garonne, Dordogne, and Aveyron, with part of Landes and of Tarn-et-Garonne. The capital was Bordeaux. It fell into the hands of the English in 1152, was nearly all conquered by Charles V in 1377, reconquered by Henry V and Henry VI, and finally annexed to France in 1453.

Guignet's Green (gē-nyā), a pigment prepared by heating in a reverberatory furnace a mixture of three parts of boracic acid and one of bichromate of potassium, made into a thick paste with water. This color is quite fixed—it does not alter by light

or reagents, and it is quite harmless, so that it forms an excellent substitute for the greens which contain arsenic and copper.

Guild (gild), a society or association for carrying on commerce, a handicraft, or some other undertaking. Such associations are known from very early times in various countries. The societies of tradesmen exclusively authorised to practice their art, and governed by laws of their own, played a very important part in the middle ages. They often formed a bulwark against the oppression of the nobility, and were thus extremely conducive to the growth of municipal and civil liberty. Traces of these trade societies are found in the tenth century. In Milan we find the mechanics united under the name *credentia*. At Florence the trades were federated into twenty-one guilds or *arti*. These originated in 1282, on the overthrow of the nobility, and every candidate for citizenship was obliged to enter some particular guild. Such a step became a necessity at a period in which individual rights, as such, failed to secure respect. The purely Teutonic guilds, although connected with the constitution of the cities, possessed certain peculiarities. In the thirteenth century the German guilds of craftsmen obtained the right of defending by arms their own interests, and became so powerful that persons unconnected with a trade were often glad to attach themselves to them. As illustrations of the manner in which associations originally instituted for defensive purposes became the mainstay of a tyrannical monopoly may be mentioned, the frequent withholding of permission from more than a certain number of master mechanics to reside in one place, the restrictions placed upon particular branches of industry, and upon the free exercise, by each individual, of his trade except under the sanction of the guilds. With the view of destroying the political influence which they had acquired the Emperor Frederick II abolished them by a decree issued in 1240; but the decree remained without effect, as did also the clauses inserted with a similar view into the Golden Bull in 1356, and it was not until the last century that unrestricted freedom to practice any trade was established in the German states. In Austria this was done in 1860, and in 1868 it was done for all the states of the North German Confederation. In Britain trade guilds long possessed an importance which was mainly political. As the right of voting was involved in the membership of a guild, many persons, not mechanics, acquired the rights of 'freemen' by connecting themselves with some body of this kind. These guilds, in England, had no legal right to prevent any man from exercising what trade he pleased. The only restriction on the exercise of trades was the statute of Elizabeth, requiring seven years' apprenticeship. This the courts held to extend to such trades only as were in being at the time of the passing of that statute; but by an act passed in 1835, every kind of restriction on artisans, trades, etc., was abolished. The guilds or companies of the city of London (among the oldest of which are the weavers, founded in 1164; the parish clerks, in 1232; the saddlers, in 1280; the fishmongers, in 1284) are still very important corporations, which give relief to poor and decayed members, and also manage vast funds bequeathed for benevolent purposes. Besides the secular guilds there were from a very early period, in Britain, religious guilds. From the time of Henry II all such guilds were required to have a charter from the crown. In 1388 a return of these guilds was ordered to be made, and it was then found that that of Corpus Christi, York, numbered 14,800 members. The property of the religious guilds was sequestrated in the reign of Henry VIII. In France guild-privileges were sold by the state from the tenth century till the revolution of 1789, but at that date guilds were entirely abolished. This was done also at a later period in Belgium, Holland, Italy, Sweden, and Denmark. Many of the trades-unions have now somewhat of the character of the ancient guilds.

Guildford (gil'furd), a town of England, the county town of Surrey, on the Wey, a well-built and thriving place. It has an iron-foundry, corn, paper, and powder mills, and an important grain market. Pop. (1911) 23,823.

Guildhall (gild'hal), the city hall of London, Cheapside, first built in 1411, all but consumed in the great fire of 1666; and in 1669 rebuilt. The front was not erected until 1789. The most remarkable room is the hall, 153 feet long, 48 broad, and 55 high, used for city feasts, etc. It contains the curious wooden statues of Gog and Magog. In the common-council room is a collection of pictures, some of them valuable. There is also a library in the Guildhall.

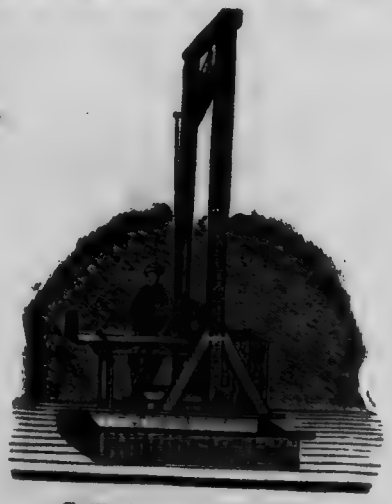
Guillemot (gil'e-mot), a name of several web-footed birds belonging to the family Alcidæ or auks. The guillemots have a straight, com-

pressed, and pointed bill, covered with feathers as far as the nostrils, and have no hallux or hind-toe. The wings are pointed and very short, the legs also short, and placed far back. They live on fish, and build on precipitous rocks adjoining the sea. The common guillemot (*Uria troile*), about 18 inches in length, lays one egg; the black guillemot (*U. grylle*), of the North Atlantic, is smaller and lays two or three eggs; the *U. lacteolus* is entirely white.

Common Guillemot (*Uria troile*).

Guilloche (gil-losh'), in Grecian architecture, an ornament consisting of straight or curved bands symmetrically interplaited.

Guillotine (gil-lo-tēn'), an engine for beheading persons at one stroke—an invention of the middle ages—adopted with improvements by the National Assembly of France during the first revolution on the proposal of a Dr. *Guillotin*, after whom it is named and still used in France. The original invention of machines of this kind is ascribed to the Persians, and similar instruments were in use in Italy and Germany in the middle ages. In the guillotine decapitation is effected by means of a steel blade loaded with a mass of lead, and sliding between two upright posts, grooved on their inner sides, the person's neck being confined in a circular opening between two planks, the upper one of which also slides up or down. The condemned is strapped to a board, which in the cut is shown resting horizontally on the table in front of the upright posts, but which is easily drawn forward and set upright when necessary, and again canted over upon the table and rapidly moved up so as to place the neck of the condemned within the semicircle of the lower plank, the other being raised for the purpose. On the right of the table is a large basket or trough of wicker-work for the reception of the body. Under the place where the head rests is an oblong trough for its reception. The knife is fixed to the cap or lintel on the top of the posts by a claw in the form of an 8, the lower part of which opens as the upper part closes. This claw is acted upon by a lever, to which a cord is attached.



Guillotine as used in Paris.

Guimaraens, or Guimarães (gē-mā-räns'), a town in Portugal, province of Minho, strongly fortified and well built. Pop. 9104.

Guimaras, an island of the Philippines between Panay and Negros. It is about 24 m. long, and is mountainous in the w. (highest peak, Mt. Jaljat), and flat in the s. Pop. 20,000.

Guimbal, pueblo, Iloilo, province, s. coast of Panay I., Philippines, 65 m. s. s. w. of Conception. Dyewoods and woven fabrics are exported. Pop. 11,000.

Guindulman, a town at the southeast extremity of Bohol Island, Philippines. Pop. 12,000.

Guinea (gin'ē), a geographical division of Western Africa, including the Atlantic coast-line and an indefinite area of the interior between the frontiers of Senegambia and Cape Negro, or Cape Frio (where German territory now begins). It is divided into two districts, lying north and south of Cape Lopez; the former, called North or Upper Guinea, includes Sierra Leone, Liberia, the Grain, Ivory, Gold, and Slave coasts, the states Ashantee, Dahomey, Benin, etc.; the latter, called South or Lower Guinea, includes Congo, Angola, and Benguela. See the separate articles.

Guinea, an English gold coin worth 21*s.* sterling. Guineas were first coined in the reign of Charles II (1663), of gold from Guinea, and bore the figure of an elephant. Its value ranged at different times from 20*s.* up to 30*s.*, until, in 1717, it was fixed at 21*s.* In 1817 the coin was withdrawn from circulation. It is, however, still customary to estimate professional honoraria, etc., in guineas.

Guinea, Gulf of, that portion of the Atlantic which washes the shores of Upper Guinea, between Cape Palmas and Cape Lopez, and including the bights of Benin and Biafra. The islands of Fernando Po, Prince's, and St. Thomas, are within this gulf.

Guinea, New. See *New Guinea*.

Guinea-corn, a name given to durra, one of the grains also called millet. In the United States it is cultivated under the name of broom-corn.

Guinea-fowl, or Pintado, a genus of gallinaceous birds, family Phasianidæ or pheasants, originally all natives of Africa. The common guinea-fowl (*Numida meleagris*), now well known as a domestic fowl, has a slate-colored plumage varied with round white spots. It is about the size of a common fowl, and is of a noisy and quarrelsome disposition. Its eggs are

Guinea-fowl (*Numida meleagris*).

esteemed. Among the other species of guinea-fowl may be mentioned the *Numida vulturina* (or *Acryllium vulturinum*), by far the most beautiful of them all, with somewhat vulturine head and neck; the *Numida mitrata*, found in Kaffraria and in Madagascar, and the *Numida cristata*, a native of the Cape of Good Hope.

Guinea-grass (*Panicum maximum*), a very tall species of grass, a native of Africa, of the same genus with the millet, often 6, and sometimes even 10 feet in height. It has been naturalized in South America and the West Indies, and largely cultivated for fodder. It does not perish even in the temperate zone, but there it is not so productive as in warmer climates.

Guinea Pepper (*Xylopia aromatica*), a lofty tree of the same family with the custard apple. Its fruit, consisting of dry carpels, is used as pepper, 'Negro Pepper.' The term Guinea Pepper is often used as an equivalent for *Grains of Paradise*, or Malaguetta. It is also a common designation of *Capsicum frutescens*. See *Capsicum*.

Guinea-pig, a well-known rodent mammal, family Caviidæ or Cavies. The domestic specimen is sometimes regarded as descended from *Cavia aperea*, and sometimes termed *Cavia cobaya*. It is a native of South America (like the other cavies), and resembles the pig only in its grunting voice. It is a timid little animal, extremely prolific, and it feeds on vegetables, especially parsley, bread, grain, etc. It is very destitute of intelligence.

Guinea-plum, the fruit of a West African tree, *Parinarium excelsum*, order Chrysobalanaceæ, growing to the height of 60 feet.

Guinea-worm (*Filaria Medinensis*), a parasitic worm of the order Nematoda, white, of the thickness of pack-thread, somewhat attenuated at the hook-shaped posterior extremity. It varies in length from 6 inches to several feet, and it is found in the intertropical regions of the Old World. It is frequently found in the tissue of the human body below the skin, and produces a painful ulcer, out of which a small portion of the worm issues to eject its eggs. It is then carefully extracted by winding it round a stick once or twice every day, care being exercised not to break the worm. The manner in which it effects an entrance into the body is unknown.

Guingamp (gaṇ-gaṇ), a town in France, dep. Côtes-du-Nord, on the Trieux; has manufactures of linen, thread, etc., and several tanneries. Pop. 9283.

Guipuzcoa (gē-puth'ko-ä), one of the three Basque provinces, in the N. E. of Spain, bounded N. by the Bay of Biscay; N. E. by France; area, 728 square miles. The coast is bold and 728 sq. miles. The coast is bold and rocky, and much indented; the interior is generally mountainous. The chief riches of the province are in its minerals, particularly iron, and its woods, which are used in smelting it. San Sebastian is the capital. Pop. 195,850.

Guisborough (giz'bu-rō), a town in England, in the county of York (North Riding), situated in a narrow but fertile valley, extending along the Tees. It has ropeworks and tanning. Pop. 7,062.

Guiscard (gis-kär), Robert (that is, *Robert the Cunning*), Duke of Apulia and Calabria, a son of Tancred de Hauteville, born in 1015. His brothers, having acquired large possessions in Italy, Robert followed them about

1053, and in the same year captured Pope Leo IX at Civitella. On the death of his brother Humphrey he was proclaimed count of Apulia in 1057. He then conquered Calabria, and Pope Nicholas II made him gonfalonier of the church. Having become a tributary of the holy see, and suppressed the privileges of the Apulian nobility, he sent his youngest brother, Roger, to seize Sicily. Robert himself arrived in Sicily in 1061, and, in conjunction with his brother, defeated the Saracens at Enna. Returning to Italy, Robert conquered the towns still remaining in the hands of the Saracens, being detained from 1068 to 1071 at the siege of Bari. In 1074 he was excommunicated by Gregory VII for refusing to become his vassal, but the ban was removed in 1080. As his daughter Helen was betrothed to the son of the Byzantine emperor, Michael VII, Guiscard, on the latter's deposition, took up arms in his favor, and defeated Alexis Comnenus at Durazzo (1082). As Gregory VII had been meanwhile imprisoned by the invading forces of Henry IV of Germany, Guiscard delivered the pontiff in 1084. He then went again to Epirus, where he repeatedly defeated the Greeks, and, by means of his fleet, made himself master of many of the islands of the Archipelago. He was upon the point of advancing against Constantinople, when he died in the island of Cephalonia in 1085.

Guise (gwēz), a town of France, dep. of Aisne, beautifully situated on the left bank of the Oise. It has manufactures of textiles, iron and copper foundries, etc., and a large work for making stoves, connected with which is an edifice in which live some 400 families of the working people. It is an ancient city, and its castle gave its title to the distinguished family of that name (see the following article). Pop. (1906) 7562.

Guise (gwēz), a distinguished ducal family of France, a branch of the house of Lorraine. The founder was Claude, a son of René II, duke of Lorraine, who in 1506 became naturalized in France. In his favor the county of Guise was erected in 1528 by Francis I into a duchy. He died in 1550, leaving behind him five daughters (the eldest of whom, Marie, married James V of Scotland, and was the mother of Mary Queen of Scots), and six sons—François, who succeeded him, Charles (Cardinal of Lorraine), Louis (Cardinal of Guise), Claude, François, and René. The family acquired great political importance on the accession of Francis II, who was married to Mary Queen of Scots. The direct line became extinct in 1675. In 1704 the title was revived for the house of Condé. —Two of the dukes require particular mention.—FRANÇOIS DE LORRAINE, the second duke, born in 1519, early distinguished himself in war, especially at Metz, which he defended with success against Charles V, and at the battle of Renti, 1544. In his Italian expedition (1556-57) he failed to conquer the kingdom of Naples. But he was successful in that which resulted in the final annexation of Calais to France. Under Henry II and Francis II he was the virtual ruler of France. On the death of Francis II the factions of Condé and Guise arose, the Protestants (Huguenots) being on the side of the former, the Catholics on that of the latter. When civil war broke out the Duke of Guise took Rouen and Bourges, and won the battle of Dreux in 1562. He was preparing for the siege of Orleans, the central point of the Protestant party, when he was assassinated by a Huguenot nobleman, Feb., 1563. He left memoirs written by himself.—HENRY, third duke, eldest son of the preceding, was born in 1550. He was a bitter opponent of the Huguenots, and fought against them at Jarnac and Moncontour, and advised the massacre of St. Bartholomew (1572). From revenge he personally conducted the assassins to the house of Coligny. In 1576 was formed the Catholic League, first projected by his uncle, the Cardinal of Lorraine. A period of civil war followed, the party of Guise proved too strong for his opponents, and having brought about a rising of the Catholics in Paris (May 1588), he entered the city in triumph. He might now have made himself master of the throne, but negotiations were set on foot, and the duke's displays of imprudent ambition led to his assassination in the king's cabinet. December 23, 1588, at Blois, whither the states had been summoned in order finally to ratify the treaty that had been arranged.

1, French Guitar of Seventeenth Century. 2, Modern Guitar.

Guitar (gi-tär'), a stringed instrument with a hollow body, and a neck somewhat similar to that of a violin, used especially to accompany the voice.

The modern or Spanish guitar has six strings, the three highest of gut, the three lowest of silk covered with fine wire, tuned respectively to the E in the second space of the bass staff, A its fourth, and the treble D, G, B, and E. The intermediate intervals are produced by bringing the strings, by the pressure of the fingers of the left hand, into contact with the frets fixed on the key-board, while those of the right pluck or twitch the strings. It is extremely popular in Spain. The Spaniards derived it from the Moors, who brought it from the East.

Guizot (gē-zō), FRANÇOIS-PIERRE-GUILLAUME, a French historian and statesman, born at Nîmes in 1787; died in 1874. His father, a lawyer, having in 1794 perished by the guillotine, his mother and her three sons retired to Geneva, where François was gratuitously educated at the gymnasium. In 1805 he commenced legal studies at Paris, but gradually drifted into the literary profession. In 1812 he married Mlle. de Meulan, editor of the *Publiciste*, and became professor of history at the Sorbonne. On the fall of the empire he obtained several public offices, such as councilor of state, and director-general of the departmental and communal administration. In 1816 he published *Du Gouvernement Représentatif et de l'Etat actuel de la France*, and *Essai sur l'Instruction Publique*. In 1820 the Duc de Berry was assassinated, and Guizot's party fell before in ultra-royalis. reaction. In 1825 he was deprived of his chair on account of the political character of his lectures, but it was restored to him in 1828. In 1829 he again became councillor of state, and in 1830 was elected deputy for the arrondissement of Lisieux. After the July revolution he was appointed minister of the interior, but resigned in 1831. After the death of Périer, Guizot, along with Thiers and De Broglie, formed a coalition ministry, and he rendered great service as minister of public instruction. He became ambassador at the British court in 1840, and next year he became the real head of the government of which Soult was the nominal chief. He retained the office of minister of foreign affairs until 1848, and during that period opposed all measures of reform. After the fall of Louis Philippe, Guizot escaped and fled to England. Henceforth he practically retired from public life. Born of a Calvinist family, Guizot always remained a stern Protestant of the orthodox type, although he zealously supported the temporal authority of the pope. Among his numerous works may be mentioned, *Histoire de la Civilisation en France*, *Histoire générale de la Civilisation en Europe*; *Histoire de la Révolution d'Angleterre*; *Washington*; *Discours sur la Révolution d'Angleterre*; *Méditations et Etudes Morales*; *Guillaume le Conquérant*; *Mémoires pour servir à l'Histoire de mon Temps* (1858-68); *Méditations sur l'Etat Actuel de la Religion Chrétienne*; *Mélanges Biographiques et Littéraire*; *Histoire de France Racontée à mes Petits Enfants*; etc.

Gujerat, GUJARAT (gö-ja-rät'), or GUZERAT, a maritime province in Western Hindustan, Presidency of Bombay; total area, 70,038 sq. miles; pop. over 9,000,000. The southwest portion is an extensive peninsula, with the Gulf of Kach (Cutch) on the northwest side, and the Gulf of Cambay on the southeast. The central districts form an extensive plain, but the northern and eastern districts are mountainous, rugged, and jungly. The rivers include the Narbada, Myhe, and Sabarnati. The climate is very hot in summer, and during the hot months the surface mostly appears sand or dust, and in the rainy season a thick mire; but it is extremely fertile. Gujerat comprises a number of native states within its area, the chief being the scattered territories of the Gaekwar or Guicowar of Baroda. The population presents an extraordinary assemblage of sects and castes. It gives name to the vernacular language of Northern Bombay—Gujaráti. The area of the British portion, comprising the districts of Surat, Broach, Kaira, Panch Mahals, and Ahmedabad, is 10,158 square miles, and the population estimated at about 4,798,504.

Gujranwála (güj-rän-wä'la), a town of India, in the Punjab, administrative headquarters of a district of the same name. It has inconsiderable manufactures of country wares, such as brass vessels, etc. Pop. about 30,000.—Area of district, 2578 square miles.

Gujrát (göj-rät'), a district of India in the lieutenant-governorship of the Punjab, in the Rawál Pindi division between the Jehlam and the Chenab. Pop. about 700,000.—GUJRÁT, the capital, 5 miles from the Chenab, is a commercial center. Its manufactures are principally of cotton and of Gujrát ware, that is, inlaid work in gold and iron. Pop. 19,410.

Gulbar'ga (göl-bär'ga), a town of India, in the state of Hyderabad. Pop. 29,228.

Gulden (göl'den), a silver coin of Austria-Hungary and also of Holland, worth about 40 cents. Also called a *florin*.

Guledgarh (*Guledgud*), a town of India in the Kaladji district, Bombay Presidency. Pop. about 12,000.

Gules (gūlz), the heraldic name of the color red. It ranks after the metals *or* and *argent*.

Gulfport, county seat of Harrison County, Mississippi, half way between New Orleans and Mobile. Has extensive exports of lumber and naval stores; has railroad shops, foundries, saw mills, trucking interests, etc.

Gulf Stream, one of the most celebrated of the oceanic currents, so called because it issues from the Gulf of Mexico. It owes its origin to the fact that the westward-moving waters of the tropical portion of the Atlantic, encountering the eastward projection of South America, become divided into two currents, one setting southwards along the Brazilian coast, and the other northward past the mouths of the Amazon and Orinoco, into the Caribbean Sea. It then enters the Gulf of Mexico, and thence emerges through the Channel of Florida as the Gulf Stream. Its course is next to the north and eastward, in a direction parallel to the coast of the United States, past Cape Hatteras (lat. 35° 18′), along the southern edge of the 'great banks' of Nantucket and Newfoundland (between the meridians of 48° and 60° west), after which its course as a distinct current cannot be traced. In the earlier part of its course, especially when rounding the extremity of Florida, the Gulf Stream forms a well-defined current, distinguished by its high temperature and its deep blue or indigo color. On account of the descent of the Polar or Baffin Bay current along the coast in a direction opposite to that of the Gulf Stream, the water on its inland side is colder than that to the eastward of it. The difference of temperature between the Gulf Stream and this cold current sometimes amounts to 20° (or even 30°) Fahr. The velocity of the Gulf Stream varies with its course. Within the Florida Channel it attains a mean of 65 miles per day, this sinks to 56 miles off Charleston, becomes 36 miles to 46 off Nantucket, and 28 miles to the south of the Newfoundland Banks; 300 miles to the eastward of Newfoundland its movement is hardly perceptible. At the bottom of the Florida Channel the observed temperature is 34°, that of the surface from 80° to 84°. Geographers have greatly exaggerated the influence of the Gulf Stream on the temperature of Europe. If it possesses any *direct* influence such must be extremely small, as the current is both too narrow and too shallow, and its slight amount of superior heat probably vanishes after it has passed Cape Hatteras. The relatively high temperature of western and northwestern Europe must rather be referred to the general set of the tropical waters to the northeast, and to the warm winds blowing in the same direction, and not to the Gulf Stream exclusively.

Gulf-weed (*Sargassum*), a genus of seaweeds (Algæ) suborder Fucaceæ, of which one species, *S. Baccifĕrum*, exists to an enormous extent in the tropical seas. It floats on the surface, and is propagated by buds. It derives its ordinary appellation from the exploded idea that it is borne on the Gulf Stream from the Gulf of Mexico. Several areas of the ocean exhibit great quantities of this and other weeds floating on the surface. One such, the Sargasso Sea, is in the North Atlantic, lying southwest of the Azores, and north of the tropic of Cancer.

Gull (gul), the general name of a family of birds distinguished by their straight bill, bending downwards towards the point, and marked below the under mandible by a triangular prominence, by their large wings, slender legs, palmated feet, and small hind toe. Generally seen in large flocks, the larger species frequent the sea, the smaller, lakes or rivers. They swim well, but are incapable of diving. Their flight is rapid and long sustained. They are extremely voracious, and feed on every kind of

Lesser Black-Backed Gull (*Larus fuscus*).

animal food, putrid or fresh. Their principal food is fish, which they catch with great agility, darting down like an arrow. They breed only once a year, laying two to four eggs. The species are exceedingly numerous, and resemble each other greatly. Among the principal are the common gull (*Larus canus*), which breeds on the coast, or inland in moory districts; the lesser black-backed gull, *L. fuscus;* the black-headed gull, *L. ridibundus*, of which the masked gull, *L. capistrātus*, is only a variety; the ivory

gull, *L. eburneus;* the Iceland gull, *L. islandicus*, distinguished by its white quill feathers from the herring gull, *L. argentatus;* the great black-backed gull; the burgomaster; the little gull, sabine's gull; the kittiwake, etc.

Gullet. See *Œsophagus.*

Gulper (gul'pėr), a deep sea eel, remarkable for the extraordinary width of its mouth.

Gulper (*Saccopharynx ampullaceus*).

Gum, a substance of various properties which exudes spontaneously from the bark of certain trees, such as the plum, the peach, etc., or from incisions made in the bark to facilitate the flow. Gums form non-crystalline rounded drops or tears, the purest varieties being transparent or translucent, of a pale yellow but sometimes of a dark color. When dissolved in water gum forms a thick, smooth fluid, with considerable viscosity. Some gums, such as gum-arabic, dissolve in water; others, like tragacanth, are only partially soluble; they are insoluble in alcohol. this property distinguishing them from resins. They have no odor, and only a very faint taste. The different kinds of gum receive their names from the countries from which they are imported—such as gum-arabic, gum-senegal, Barbary gum, East India gum, etc., and from individual features, as cherry-tree gum, tragacanth, etc. *Gum-resins* require water and alcohol to dissolve them. See *Gum-resins.*

Gumal. See *Gomul.*

Gum-arabic, is the purest form of gum, and may be regarded as typical. It comes from various species of Acacia, such as the *Acacia vera*, *A. seyal*, and *A. arabica* or *nilotica* (see *Acacia*). The gum exudes spontaneously, and its appearance is an indication of the tree being in an unhealthy condition; but in order to get it in sufficient quantity incisions are made in the bark. Gum-arabic is very largely employed in the finishing and dressing of fabrics; for thickening the colors in calico-printing; in pharmacy; as a cement; in ink-making; for making crayons and water-color cakes, and for many other purposes. The purest gum-arabic is in round tears, transparent, and almost colorless, faintly odorous, completely soluble in water, the solution being feebly acid.

Gumbinnen (gŏm-bin'en), a Prussian town, prov. East Prussia, on the Pissa. It has brewing and distilling, and manufactures of woolen and linen cloth. Pop. 14,194.

Gum-boil, an abscess in the gum, generally the result of bacterial infection through the presence of decayed teeth or stumps. The carious tooth or stump, if the inflammation proceeds from this cause, should be removed. The purulent matter should be evacuated by a free incision, and the mouth often washed with tincture of myrrh and water.

Gum-cistus (*Cistus ladaniferus*), a plant largely cultivated in Portugal, and yielding a gum of a pleasant balsamic odor.

Gum-dragon. See *Tragacanth.*

Gum-elastic. See *caoutchouc, India Rubber.*

Gum-elemi. See *Elemi.*

Gum-juniper, the resin of *Callitris quadrivalvis*, a coniferous tree of Barbary, used in varnish, etc.

Gumming (gum'ing), a disease of certain fruit-trees, as cherries, plums, apricots, peaches, etc., consisting in a morbid exudation of gum, and generally resulting in the death of the tree.

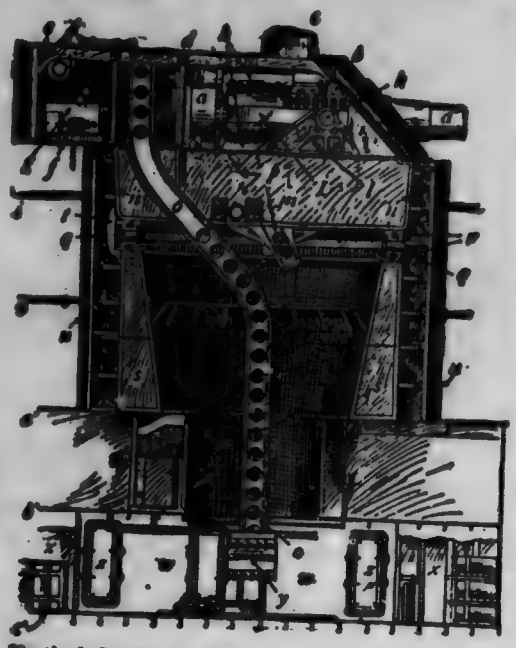
Gum-resins, solidified juices exuded by various plants. They contain a gum, which is soluble in water, and a resin, which dissolves in spirit, so that the body usually is nearly quite soluble in dilute alcohol; but there are usually present in addition essential oil, and a variety of impurities. The gum-resins have frequently a strong and characteristic taste and smell. They are solid, opaque, and brittle. The common gum-resins are aloes, ammoniacum, asafœtida, bdellium, galbanum, gamboge, myrrh, olibanum, opoponax, sagapenum, and scammony.

Gumti, or Goomti (gŏm'tē), a river of Hindustan, rises in the northwest provinces, and flowing southeast falls into the Ganges between Ghazipur and Benares. In its course it passes the cities of Lucknow and Jaunpur. Length about 500 miles.

Gum-trees, a general name for trees of the genus *Eucalyptus* (which see).

Gun, a missile weapon, causing destruction by the discharge of a ball, bullet, or other substance, through

a cylindrical tube, along which it is propelled by the action of gunpowder or other explosive substance. The term includes small arms, such as portable,



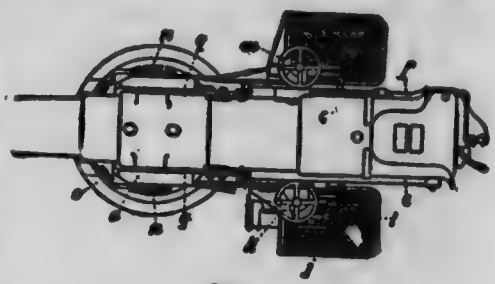
Vertical Section through a Turret and Barbette for 12-inch Guns.

a, turret-gun; *b*, turret-port armor plate; *c*, sighting-hood; *d*, turret-roof; *e*, escape-scuttle; *f*, scuttle for access from deck; *g*, electric rammer; *h*, *h*, combined hydraulic recoil and spring return-cylinders; *i*, main deck; *j*, gun-sleeve; *k*, trunnions on gun-sleeve; *l*, deck-lug; *m*, turret-gun girder; *n*, turret-pan; *o*, ammunition-hoist guide-rails; *p*, gun elevating gear; *q*, turret-rollers; *r*, *r*, upper and lower turret-roller paths; *s*, *s*, turret supports or foundations; *t*, holding-down clip; *u*, barbette-armor; *v*, gun-deck; *w*, handling-room; *x*, *x*, magazines; *y*, ammunition-hoist carriage; *z*, water-tight doors from magazines and shell-rooms to handling-room; *a'*, protective deck; *b'*, upper platform; *c'*, lower platform. (From *Scientific American*.)

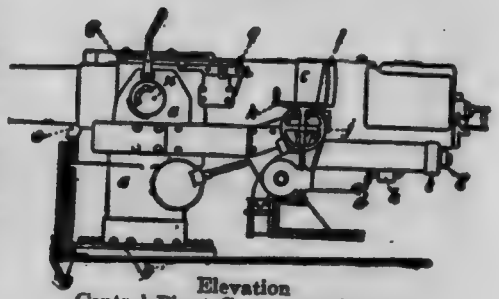
sporting and military weapons; machine-guns, which discharge a rapid succession of bullets through one or more barrels on a rest; and the heavier pieces termed cannon or ordnance. See *Cannon*, *Rifle*, *Machine-gun*, etc.

Gunboat, a war-vessel belonging to the class next in size below a cruiser, and mounting one or more heavy guns. They are useful because of their light draft, which enables them to run close in shore or up rivers whose depth would prevent the passage of larger vessels. The term was originally applied to small vessels mounting one gun, but in the United States navy the term is applied to men of war of less than 2000 tons, equipped with large and small ordnance and capable of considerable speed though the light draft feature is retained. Special gunboats have been built for shallow rivers, but the class is not a large one and is not apt to be greatly added to because of its limited range of effectiveness except for special purposes.

Gun-carriage, the structure on which a cannon is mounted, and on which it is fired. Gun-carriages are of very various constructions. In the case of a field or siege piece the carriage is united, for traveling, with a two-wheeled forepart, termed a *limber*, to which the horses are attached, so as to form a single four-wheeled carriage. In action the gun



Plan



Elevation

Central Pivot Gun-mount for 6-in. Rapid-Fire Gun.

a, top-carriage saddle; *b*, pedestal or pivot (the only part of the pedestal showing in the cut is the deck flange, the remainder being in the interior of the top-carriage); *c*, cylindrical sleeve; *d*, hydraulic recoil-cylinder; *e*, *f*, spring return-cylinders; *g*, projecting arm by which gun is attached to spring return-rods; *h*, projecting arm by which gun is attached to recoil-cylinder piston-rod; *j*, hand-wheel for elevating gear; *k*, hand-wheel for training gear; *l*, shoulder-piece; *m*, auxiliary training-wheel; *n*, *n*, trunnion bearings; *o*, gun-shield; *q*, *q*, gun-sights.

is unlimbered, and then rests on its pair of wheels, and on a strong support termed the *trail*. A gun in a fortress has its carriage commonly mounted on

what is termed a *traversing platform*, that is, a strong framework supported on metal trucks or small wheels. These trucks are constructed to run on metal rails, which are laid in concentric arcs of circles, whose centers are a real or imaginary pivot close to the mouth of the embrasure through which the gun fires. By this means the muzzle of the gun, when run up, is brought nearly over the pivot, so that the direction of its fire may be altered laterally considerably, and yet allow of a very narrow embrasure. Carriages on the 'disappearing principle,' which are visible to the enemy only during the acts of aiming and firing (while the loading is effected under shelter), are best exemplified in those of Col. Moncrieff. In one of these the carriage is so contrived that a heavy counterweight attached to it is sufficient to raise the gun into the position for firing, the sides of the carriage having some resemblance to the 'rockers' of a rocking-horse. The recoil brings the gun down into the loading position, after which it is again brought into firing position as before. The iron carriages now made are thus elaborate mechanical structures. In mortars a cast-iron bed takes the place of a carriage.

Guncotton, or **Pyroxyline**, is an explosive substance formed by the action of nitric acid on cotton. In the process of manufacture sulphuric acid is mixed with the nitric, its function being to absorb the water formed by the weakening of the nitric acid as it gradually combines with the cotton. The product of this process is a chemical compound of four or five times the explosive power of gunpowder. The cotton is generally reduced to a finely divided condition, and the guncotton molded into discs of suitable sizes. When ignited in a free state it burns with a strong flame; it is only when fired by a detonating fuse or when heated in confinement that it explodes. The presence of water and other substances does not interfere with this kind of explosion. From this follows the important fact that it can be kept wet with safety while in a condition in which it may be exploded by means of a detonator. *In short, when wet it is quite safe, and yet quite ready for work at a moment's notice*; for, while it refuses to burn even in the heat of a powerful flame, the application of a large or of a small detonator inserted in one dry disk of guncotton causes the wet mass to explode with its full violence. Bursters of guncotton and water have been used in shells for certain purposes. When exploded it produces little smoke and a very small amount of residual matter. There are also preparations allied to guncotton with wood fiber as a basis, such as Schulze's powder, sawdust powder, etc. An imperfect chemical form of guncotton termed collodion, soluble in a mixture of ether and alcohol, is used in photography and surgery.

Gunduck. See *Gandak*.

Gunja. Same as *Hashish*.

Gunnel (gun'el), or **Butterfish** (*Centronotus gunellus*), a fish which belongs to the family of the Blennies. The common gunnel resembles an eel, is about 6 inches in length, is brown in color and has black spots on the base of the dorsal fin. It is termed 'butterfish' on account of the mucous secretion of its skin.

Gunner, in the United States navy is a warrant officer of the line who ranks as assistant to the ordnance officer and under him is responsible for the ordnance of the ship. Gunners are promoted from the leading petty officers after examination and after six years' service are eligible to take the examination for chief-gunner and if they pass rank with (but after) ensigns, also to take examinations for appointment as ensigns.

Gunnera (gun'er-a), a genus of plants of the breadfruit order, one species of which (*G. scabra*), a native of S. America, somewhat resembles the rhubarb, and is used as an ornamental plant. It has large rough leaves, astringent roots, while its leaf-stalks are a substitute for rhubarb.

Gunnery (gun'er-i), the science of conducting the fire of artillery. Gunnery may be divided into the theoretical and practical branches. The former consists chiefly in the application of mathematics to the solution of the problems in dynamics involved in the consideration of the motion of shot through the air, and is essential to the design of good systems of rifling and well-proportioned projectiles. Practical gunnery, which deals with the actual firing, has reference rather to the use of individual guns than to the handling of artillery on a large scale. Theoretical gunnery would be simple were the projectiles fired in vacuo, as gravity alone would, in such a case, require to be taken into account, and the path of projectiles would simply describe a parabola. The line taken by a projectile (or its *trajectory* as it is called) is, however, subject to modifications caused by the resistance of the air, the form of the shot, etc. Among the things to be considered in

gunnery are the *velocity* of the projectile, initial and subsequent, the *angle of elevation* of the piece, the *range* or distance to which the projectile is carried, etc. With cast-iron spherical shot the chief complication arises from the center of gravity never falling exactly in the center of the figure. Rifled guns, however, fire projectiles with a *certain known rotation*, and in the case of elongated shot, these are more accurately centered in the bore by the action of the grooves, and possess the faculty of traveling point first, and of thus overcoming the resistance of the air. One mechanical disadvantage belongs to rifled shot, namely, the wild irregularity of their ricochet, a disadvantage which, however, does not apply to shells burst on the instant of graze by percussion fuses, or before contact by time fuses. The most approved projectiles have their centers of gravity nearly half way along their axes, and in flight they carry towards the right hand of the person laying the gun, a species of deviation to which the name of *drift* or *deflection* is given. The recoil of a gun must necessarily diminish the velocity of its projectile; and this has been carefully borne in mind by men who have made gunnery their especial study.

Gunnison River, a stream of Colorado, about 200 miles in length, which flows into Grand River at Grand Junction. In its course are several magnificent cañons, the Grand Cañon being about 40 miles long, and 2500 feet in depth. There is a tunnel through the bordering mountain.

Gunny-bags are bags made of a coarse cloth or sacking manufactured in India of some native fiber, chiefly jute. They are extensively used in India in packing rice, sago, spices, etc., for export, and in America for bales of cotton.

Gunpowder (gun'pow-dèr), a mixture of saltpeter, sulphur, and charcoal. We hear of gunpowder from a very early period. It appears to have been used in China before the Christian era, though it is doubtful if they understood the making of this explosive in its modern sense. Marcus Græcus, who lived about the ninth century, describes its composition, which was also known to Roger Bacon, who refers to it in 1267. It was also apparently known to the Arabs at an early period. In 1342 the Moors employed it in the siege of Algeciras. According to the common story, the discovery of its propulsive power was due to the German monk Berthold Schwarz between 1290 and 1320. Guns are said to have been employed by Edward III in 1327, on his invasion of Scotland. It is also asserted that gunpowder was employed in 1346 by the English at Crécy. It was not, however, until the sixteenth century that its use in warfare became general. The proportion of the ingredients in the composition of gunpowder is different in different countries, and in powder for different purposes. The crude saltpeter is dissolved in an equal weight of boiling water in a copper boiler, filtered, and allowed to cool and crystallise in a trough in order to purify it from nitrates of soda and lime, chlorides of potassium and sodium, etc., the liquid being continually agitated, so that the crystals may be formed small and pure. They are then washed and allowed to drain. The sulphur is purified and ground. The charcoal is obtained from alder and willow wood, or from dogwood for the finest powder. These ingredients are first roughly mixed, then sprinkled with water and incorporated under rollers in a mill, and formed into a cake termed 'mill cake.' This is broken up under grooved rollers, and brought by pressure into 'press cake.' After this it is granulated, by being passed between toothed rollers, and separated into classes by sieves of different sizes of mesh. Within recent years a very large grain has been adopted for the heaviest charges; this is termed pellet or pebble powder. 'Pellet' powder is made by filling the cylindrical holes in a thick gun-metal plate with mealed powder, and by means of pistons under an hydraulic press, forming them into short cylinders or 'pellets,' with a small cavity at one end to catch a flame the more readily. 'Pebble' powder is made by cutting or pressing edges which divide the press cake into small cubes; these, like pebbles, have their corners rubbed off and rounded by friction. There is also 'Brown' powder, the composition of which is not well known. This powder is remarkable for equable action, greater coherency, and diminished danger in using, and for decidedly greater power under diminished pressure of gas in the barrel. Schultze's powder is also a powerful explosive, remarkable for the uniformity of its shooting. As it is necessary that the flame must traverse the interstices between the grains, the grain must be suited to the size of the charge of the gun. A smokeless powder has also been introduced. The greatest precautions must be taken to prevent fire or water from coming into contact with gunpowder. Hence it is usually kept in magazines which are of great strength in defensive works, although lighter and

well-ventilated buildings suffice under other conditions. In the transportation of gunpowder, the casks should be dust-proof, and the carriages and vessels containing it should be water-tight. As iron vessels are dangerous, gunpowder is usually packed in copper-hooped barrels made with copper nails. The explosive power of gunpowder is very great. It is, however, necessary to place it within a confined space, as, when it is heaped up in the open air, it explodes without report or much effect. As the result of experiments it appears that the weight of the gases produced by inflaming gunpowder is about six-tenths of that of the powder, and their volume 288 times its bulk, when they have attained an elasticity equal to that of the air. If the effect of heat evolved during the combustion be added, the elastic force is increased to 1000 atmospheres in round numbers.

Gunpowder, SMOKELESS. See *Smokeless Powder.*

Gunpowder Plot, a conspiracy formed in England in 1604, the second year of the reign of James I, by misguided Roman Catholics, to blow up the king and parliament in order to be revenged on the government for its severities against their religion. The time ultimately fixed for the execution of the plot was the 5th of November, 1605, when parliament was to be opened by the king in person. The plot originated with Robert Catesby, Thomas Winter, and John Wright, and was at once made known to Guido Fawkes, a zealous Catholic, who had served in the Spanish army in Flanders, and to Thomas Percy, a relation of the Earl of Northumberland. These five were the original conspirators, but the plot was subsequently communicated to Sir Everard Digby, Ambrose Rookwood, Francis Tresham, Thomas Keyes, Christopher Wright (a brother of John), and to some Jesuit fathers and others. The conspirators took a house next the Parliament House, and their original plan was by digging under this house to undermine the House of Parliament. They latterly discovered, however, that there was a cellar right under the chamber of parliament, which was occupied by a coal-dealer. They at once hired this cellar, and filled it with powder, faggots, and billets. The plot was discovered by means of a letter sent to Lord Mounteagle, a Catholic peer in favor with the court, who laid it before the secretary of state, Cecil. It was a warning couched in mysterious terms, not to be present at the approaching meeting of parliament. Cecil showed it to some of the council, and did nothing till the return of the king from a hunting party. On hearing the letter James at once divined its meaning, and declared that it referred to gunpowder. This led to investigation and to the arrest of Fawkes in the cellar, where a hogshead and thirty-six barrels of powder were discovered. It is now very generally thought that Tresham, the reputed author of the letter to Lord Mounteagle, had previously informed his lordship of the plot, and that the sending and publication of the letter were merely intended as blinds. It seems also that Cecil, knowing the king's vanity, was desirous of making him the discoverer of the plot. Catesby, Percy, and the two Wrights were killed in defending Holbeach House, in which they had taken refuge, against the sheriff. Sir Everard Digby was tried and executed at Northampton; Tresham died in prison. Fawkes, Rookwood, Winter, and others were tried at Westminster on January 27th, 1606, and executed on the 30th and 31st.

Gunroom, a compartment in a ship of war, partly occupied by the junior officers.

Güns (günz), a town of Hungary, 57 miles S. E. of Vienna. It consists of a walled town of limited extent, and a large suburb; staple manufacture woolen cloth. Pop. 7930.

Gunter (gun'ter), EDMUND, an English mathematician, who flourished in the reign of James I, and invented the instruments mentioned in following articles, as also the sector, etc. He was born in 1581 and died in 1626. He was educated at Oxford, and became professor of astronomy in Gresham College, London, in 1619. He was the first to employ the terms *cosine, cotangent,* etc.

Gunter's Chain, the chain in common use for measuring land; so called from its inventor, Edmund Gunter. Its length is 66 feet, or 22 yards, or 4 poles of 5½ yards each; and it is divided into 100 links of 7.92 inches each. 100,000 square links make 1 acre.

Gunter's Scale, a scale having various lines upon it, of great use in working problems in navigation. This scale is usually 2 feet long and about 1½ inches broad. On the one side are the natural lines, and on the other the artificial or logarithmic ones.

Guntur (gun-tör'), a town of Hindustan, presidency of Madras, district of Kistna, 46 miles from Masulipatam, and 30 miles from the Coromandel coast. Pop. about 30,000.

Gunwale, or GUNNEL (gun'l), the upper edge of the side of a ship or boat.

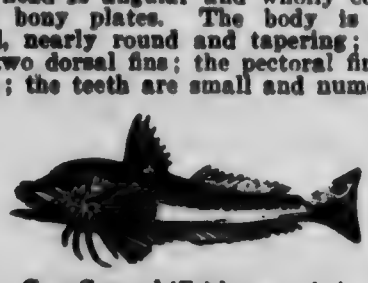
Gurhwal, GURWAL. See *Garhwal.*

Gurjun (gur'jun), a thin balsam or oil, derived from trees of the genus *Dipterocarpus*, in Burmah and the Eastern Archipelago. It is used in varnish-making, for mixing paints, preserving wood from the attacks of white ants, and also medicinally.

Gurkhas. See *Goorkhas.*

Gurmukteswar (gŏr-muk-tes'wär), a town of British India, in the Meerut district, Northwestern Provinces, on the Ganges, which is here crossed by a much-frequented ferry. A great annual fair attracts 200,000 pilgrims from all parts of the country. Pop. about 8000.

Gurnard (gur'nard), or GURNET, the popular name of acanthopterous fishes of the genus *Trigla*. The head is angular and wholly covered with bony plates. The body is elongated, nearly round and tapering; there are two dorsal fins; the pectoral fins are large; the teeth are small and numerous.



Gray Gurnard (*Trigla gurnardus*).

The gray gurnard is the *Trigla gurnardus*, common on the British coast; the red gurnard is the *T. cuculus*, also common on the same coasts; the flying gurnard is the *T. volitans*, which inhabits the Mediterranean, Atlantic, and Indian seas.

Gurney (gur'ni), SIR GOLDWORTHY, inventor; born at Treator, England, in 1793; died in 1875. He studied medicine but gave his attention to chemistry. His inventions include the lime-magnesium and oil-gas lights, the high-pressure steam jet, the tubular boiler, a steam carriage, etc., and he claimed the invention of the oxyhydrogen blowpipe and to have been the first to observe the deflection of the magnetic needle by voltaic cross currents. He was knighted in 1863.

Gustavus I (gus-tā'vus), commonly called *Gustavus Vasa*, was born in 1490, or, according to others, in 1496. He was the son of Eric Johansson, a Swedish noble, served under Svante Sture, the administrator of the kingdom, was treacherously carried off with other noble Swedes by Christian II of Denmark, and kept a prisoner in Jutland for more than a year, but at length escaped, reached, after many dangers, Dalecarlia, where he roused the peasants to resist Danish oppression, defeated the Danes, took Upsala, Stockholm, and other towns, and drove the Danes out of Sweden. Solicited to become king, he consented, and was crowned in 1527. In 1529 he procured the abolition of the Roman Catholic religion in Sweden, and established Protestanism in its stead. He died in 1560. During his long reign Sweden made great progress in commerce and civilization.

Gustavus II, GUSTAVUS ADOLPHUS, King of Sweden, a grandson of Gustavus Vasa, was born in 1594, and received a most careful education. He was trained to war under experienced generals, took his place in the state councils at the age of sixteen, and was in command of the army in his seventeenth year during the war with Denmark, which was concluded in 1613, and by which Sweden recovered important possessions on the Baltic. He then turned his arms against the Russians.

Gustavus Adolphus, King of Sweden

Afterwards he was engaged in a war with Poland, which lasted nine years, and was concluded on advantageous terms for Gustavus in 1629, he being allowed to retain important conquests in East Prussia.

His attention was now diverted from northern wars by the affairs of Germany. The oppression of the Protestants by Ferdinand II excited his sympathy, and the progress of Wallenstein alarmed him for the existence of Protestantism in Germany. Probably also he was moved by military ambition. He embarked for Germany in 1630 with about 20,000 men, landed near the mouth of the Oder, and in a short time had seized nearly all Pomerania. After taking many fortified towns, repeatedly defeating the imperial generals, at Leipsig (1631), Würsburg (1631), Passage of the Lech (1632), and conquering a great part of Germany, he was killed in the battle of Lützen, after defeating Wallenstein, 16th November, 1632. (See *Thirty Years' War.*) Though a severe disciplinarian, he was beloved by his soldiers, and the prestige of success derived from his victories lasted long after his death. He ranks among the great soldiers of the world.

Gustavus III, King of Sweden, born in 1746, succeeded his father, Adolphus Frederick, in 1771. Finding the country weary of the misrule of the nobles, he gained the good-will of the army, surrounded the assembly of the states-general, and forced them to accept a new constitution which much restricted their privileges. In 1788 he took command of the army against Russia and Denmark, and stormed the defenses of Frederickshall, destroying a great number of vessels. In 1789 he executed another *coup d'état*, arresting the opposition leaders, and passing a law extending the royal prerogative. On the outbreak of the French revolution he made strenuous exertions to form a coalition between Russia, Denmark, Sweden, and Spain, but while preparations were making, a conspiracy of the nobles was formed against him, and he was shot at a masquerade by Ankarstroem, a disbanded officer, on 16th March, 1792. He died on 29th March.

Gustavus IV (Adolphus), King of Sweden, was born on 1st November, 1778, and succeeded his father, 29th March, 1792. On assuming power Gustavus showed that he had inherited his father's hatred of the principles of the French revolution, which he carried to the extent of fanaticism. After the Peace of Tilsit he exposed himself to a war with Russia while he was at war with France, by refusing to join the continental blockade and opening his ports to England; and in 1808 he quarreled with England, his only ally. Finland was lost to Sweden in consequence, being taken by Russia, and in 1809 a revolution took place. Gustavus was dethroned, and his uncle, the Duke of Sudermania, was proclaimed king under the title of Charles XIII. Gustavus died in poverty at St. Gall, 7th February, 1837.

Gustavus V, King of Sweden, born June 16, 1858; succeeded his father, Oscar II, Dec. 8, 1907. He is a great grandson of Marshal Bernadotte of Napoleon's army, who succeeded Charles XIII in 1818. He married in 1881 the Princess Victoria of Baden, and has three sons, the oldest being the Crown Prince Gustavus Adolphus.

Güstrow (güs'trō), a town of Germany, in Mecklenburg-Schwerin, on the Nebel. It has an active trade and industries of some importance. Pop. (1905) 17,163.

Gut. See *Catgut* and *Silkworm-gut.*

Gutenberg (gö'ten-berg), Johan, the reputed inventor of printing with movable types, was born at Mayence or Mainz, about the end of the fourteenth century. Little or nothing is known of his early life. In 1434 he is said to have been living in Strasburg, and in 1436 to have started or attempted to start a printing office there; but this seems false. In 1448 we find him at Mainz, where he formed, two years after, a co-partnership with Johann Fust, and established, mainly with the money of the latter, a press, in which the *Mazarin Bible*, the *Letters of Indulgence*, and the *Appeal Against the Turks* were printed. After five years this connection was dissolved, and Fust sued Gutenberg for large advances which he could not pay, and by a judgment at law obtained possession of most of the printing materials, with which, in company with his son-in-law Schöffer, he continued to print books. After this, according to some, Gutenberg carried on a separate printing establishment; but there is no printed matter which can be ascribed to Gutenberg after 1454. He died in 1468.

Guthrie (guth'rē), a city of Logan County, Oklahoma, formerly capital of the state. It is on the Cimmeron River, 31 miles N. of Oklahoma City, and is an important trade and manufacturing center, having large lumber and milling interests, etc. Pop. 11,911.

Guthrie, Thomas, a Scottish divine, born at Brechin, Forfarshire, in 1803. He was educated at the University of Edinburgh, and used as a preacher in connection with the Church of Scotland in 1826 and held several pastorates. The work with which his name is chiefly identified out of

Scotland, was the introduction into Edinburgh of the ragged school system, then recently originated in London and Aberdeen. Into this work he threw himself with characteristic energy, employing in it both his personal labors and his pen. His *Plea for Ragged Schools* (1847) remains one of the most celebrated of his productions. He became editor of the *Sunday Magazine* in 1864, but never assumed full editorial responsibility. He died in 1873. His chief later works are, *The Gospel in Ezekiel* (1855), *A Plea for Drunkards* (1856), *Christ and the Inheritance of the Saints* (1858), etc. An *Autobiography* and *Memoir* has been published by his sons.

Guthrie, THOMAS ANTHONY, author; pseudonym F. Anstey; born at Kensington, England, in 1856. He became a member of the bar in 1880, and subsequently devoted much time to authorship, chiefly of humorous stories. Among his works are: *Vice Versa*, *The Giant's Robe*, *The Black Poodle*, *The Tinted Venus*, *Love Among the Lions*, etc.

Gutta-percha (gut'a-pėr'cha; Malay name, meaning 'gum-tree'), a substance resembling caoutchouc in many of its properties, but stronger, more soluble, and less elastic. It is the inspissated milky juice of *Isonandra Gutta* and other kindred trees of the nat. order Sapotaceæ. It chiefly comes from Malacca, Borneo, and other islands of the Indian Archipelago. When pure, gutta-percha is of a brownish-red color. Below the temperature of 50° it is as hard as wood and exceedingly tough. By an increase of heat it becomes more flexible, until at a temperature of 115° F. it becomes pasty, and between this and 140° or 150° it may be molded into all varieties of forms with the greatest ease, retaining precisely the same form as it cools and hardens to its previous state of rigidity. It is insoluble in water, soluble with difficulty in eth and other caoutchouc solvents, but very in of turpentine and naphtha. It is not attacked by solutions of alkalies nor by hydrofluoric acid, but it is acted on by sulphuric, nitric, and hydrochloric acids. Gutta-percha has been applied to a variety of purposes: as a substitute for leather, especially in the soles of shoes, etc., as an insulating coating for the copper wires of submarine telegraph cables, as an ingredient in mastics and cements, for the manufacture of flexible hose tubes, bottles, etc.

Sprig of Gutta-percha Tree.

Guttenberg, a town in Hudson County, New Jersey, on the Hudson River, opposite New York. It has manufactures of chemicals, embroideries, pearl buttons, etc. Pop. 5647.

Guttiferæ (gut-if'e-rē), a natural order of exogenous trees or shrubs, which generally secrete an acrid yellow resinous juice, in some cases of considerable value, as the gamboge yielded by the *Garcinia morella*, or the tacamahaca from the *Populus balsamifera*. They are found in the humid and hot places of tropical regions, chiefly South America. The fruit of some is highly esteemed, in particular the mangosteen and the mammee apple.

Gutzkow (göts'kō), KARL FERDINAND, a German writer, born at Berlin in 1811. After studying theology he took to journalism and politics, and became the leading spirit of a small body of reformers known as 'Young Germany.' In 1835 his novel *Wally die Zweiflerin* appeared. It was at once confiscated by the government as hostile to religion and society, and the author was imprisoned for three months. In spite of government prohibition Gutzkow managed to publish a number of works from Hamburg, where he had settled. Amongst these are: *Blasedow und seine Söhne* (1838), a satire, and *Börne Leben* (1840). He was active, also, in dramatic literature, producing *Richard Savage* (1840), *Patkul* (1841), and *Uriel Acosta* (1847), tragedies, and *Topf und Schwert*, a comedy. He died in 1878.

Gützlaff (güts'laf), KARL, a German missionary, born in 1803. He went out as a missionary to the Battas in Sumatra in August, 1826, but settled instead in Batavia, Singapore, and Siam. In 1831 he went to China, acted as British interpreter during the first Chinese war, visited Europe in 1849, and died at Victoria, Hong-Kong, in 1851. His principal works are: *Journal of Three Voyages along the Coast of China in 1831, 1832, and 1833* (London, 1834); *China Opened, or a Display of the Topography, History, etc., of the Chinese Empire* (1838); *Geschichte des Chinesischen Reichs* (Stuttgart, 1847).

Guy (gī), THOMAS, the founder of Guy's Hospital, London, was the

son of a lighterman in Southwark, and born in 1643. He was brought up a bookseller. He dealt largely in the importation of Bibles from Holland, and afterwards contracted with Oxford for those printed at that university; but his principal gains arose from dealings in South Sea stock in 1720. He amassed a fortune of nearly half a million sterling, of which he spent upwards of £200,000 in building and endowing his hospital in Southwark, besides erecting almshouses at Tamworth and supporting various other charities. He was member of Parliament for Tamworth from 1694 to 1707. He died in 1724. See *Guy's Hospital*.

Guyenne. See *Guienne*.

Guy of Warwick, an old English metrical romance, whose hero is an Anglo-Danish knight said to have been the son of Siward, baron of Wallingford, to have become Earl of Warwick, and to have slain in single combat the Danish giant Colbrand, the Dun-Cow of Dunsmore, and the dragon of Northumberland, and many other wonderful feats. He is said ultimately to have become a hermit in Warwick.

Guyon (gē-yōn), JEANNE-MARIE BOUVIER DE LA MOTTE, MADAME, a celebrated mystic, the introducer in France of the system of Quietism, was born at Montargis 13th April, 1648. At the age of sixteen she was married to Jacques Guyon, after whose death in 1676 the tendency to mystic enthusiasm which had characterised her younger years, again acquired ascendency, and she began the religious propagandism of her extreme views of self-abnegation, indifference to life and death, and even to future salvation or perdition. She became associated with some enthusiastic priests, abandoned her children and her goods, reserving a moderate annuity; and moved from place to place, making numerous proselytes. She also published numerous works, such as *Le Cantique des Cantiques interprété selon le Sens Mystique* (1685); *Poésies Spirituelles* (five vols., 1685); *Discours Chrétiens et Spirituels* (1716), etc. At last the Archbishop of Paris thought it necessary to take steps against the spread of Madame Guyon's mystical doctrines. Through his influence she was shut up in the convent of the Visitation, but afterwards released at the instigation of Madame Maintenon, who herself became for a time a convert to the new doctrines, and allowed Madame Guyon to preach in the seminary of St. Cyr, where she made a convert and disciple of Fénelon. A commission of ecclesiastics, chief amongst whom was Bossuet, now sat in judgment, and the doctrines of Madame Guyon were condemned (1695). This led to her being imprisoned for some years, latterly in the Bastille, whence she was liberated in 1702. The rest of her life was spent in retirement and in works of charity. She died in 1717.

Guyot (gē-yō), ARNOLD, geographer and physicist, born in Switzerland in 1807. He studied theology at Berlin, then took up natural science, and became professor of history and physical geography in the Academy of Neufchâtel. He shared in Agassiz's investigations of glacier phenomena of the Alps. In 1848 he emigrated to the United States and delivered lectures in Boston, which afterwards appeared under the title *Earth and Man*. He rendered much service to meteorological science in connection with the Smithsonian Institution. In 1855 he was appointed professor of geology and physical geography in the College of New Jersey, Princeton, where he continued until his death in 1884.

Guy's Hospital, a London hospital, founded in 1723 by Thomas Guy (see *Guy, Thomas*). The original building, completed in 1725 and endowed at a cost of over £200,000, contained accommodation for 400 sick or incurable persons. It has since been improved and enlarged greatly, and is now the largest in London, the beds amounting to 720. Attached to the hospital is an extensive medical school containing lecture-rooms, theaters, museums, and medical library.

Guzerat. See *Gujerat*.

Gwalior (gwä'lē-or), a city and fortress of Hindustan, capital of the state of Gwalior, situated miles south from Agra. The fortress the largest, the strongest, and the most magnificent in India. It stands on an isolated rock about 350 ft. high and nearly perpendicular in the upper part. The fortress contains wells and reservoirs of water, and is inaccessible except by steps up the side of the rock. Old Gwalior, the town at the northern angle of the base of the rock is built of stone, and has some remarkable ruins of temples and an interesting example of old Hindu palace architecture. The new town, known as New Gwalior or Lashkar (the camp), the residence of the ruler, Maharajah Sindhia, has sprung up recently on the southeastern skirt of the rock, but is already a flourishing city with a pop. of 89,154.—The State of Gwalior, in political relationship with the government of India, consists of sev-

eral portions of territory, otherwise known as Sindhia's Dominions, the largest and most compact portion, usually known as Gwalior, being the one containing the above town and fortress. The total area of Gwalior is about 20,000 sq. miles. Gwalior is not as a whole very fertile; one of its most notable products is opium. The drainage is chiefly taken by the Chambal. Pop. about 3,000,000, mainly Hindus.

Gwyniad GWINIAD (gwin'i-ad; W. from *gwyn*, white). The *Coregŏnus Pennantii*, a fish of the salmon or trout kind found plentifully in some of the Welsh lakes, in Ulleswater, and in

The Fortress of Gwalior.—From an original sketch.

many lakes in Europe. It is gregarious, and may be taken in great numbers at a draught.

Gwynn (gwin), ELEANOR, better known by the name of *Nell*, a celebrated mistress of King Charles II, was at first an orange girl, and also gained her bread by singing from tavern to tavern. About 1667 she became the mistress of Lord Buckhurst, who surrendered her about 1670 to the king. As mistress of the king she had an establishment, and was made lady of the privy chamber to Queen Catharine. She was merry and open-hearted, is said to have been faithful to Charles, mindful of old friends, and a liberal patroness of the poets Dryden, Lee, Otway, and Butler. From her are sprung the dukes of St. Albans. She died, according to some accounts, in 1687, according to others in 1691.

Gyges (gī'jēz), a king of Lydia who reigned, according to Herodotus, B. C. 716-678. He was the favorite of the Lydian king Candaules, who, to convince him of the beauty of his queen, showed her to him naked. The queen was so incensed that she ordered Gyges either to murder the king, ascend his vacant throne, and become her husband, or to atone for his curiosity by death. He chose the former.

Gymnasium (jim-nā'zi-um), the name given by the Greeks to the public building where the young men, quite without clothes (hence the name, from *gymnos*, naked), exercised themselves in leaping, running, throwing the discus and spear, wrestling, and pugilism. Its objects, however, were extended also to the exercise of the mind; for here philosophers, rhetoricians, and teachers of other branches of knowledge delivered their lectures. Gymnasia were at first only open level places, surrounded by a wall, and partitioned off for the different games. At a later date they were composed of a number of connected buildings, spacious enough to admit many thousands. See *Gymnastics*.

Gymnasium, a term applied in Germany to a class of schools in which formerly Latin and Greek, and the branches connected with antiquity, were taught almost to the ex-

clusion of other subjects. A more practical bent is given to the course of instruction in these institutions now, though the *real-schools*, as they are called, are the institutions specially established for high-class education in such branches as mathematics and physical science, history and modern languages. The gymnasia are the feeders of the universities, and the training adopted in them is specially intended to equip the pupils for entering these institutions. The last or exit-examination, to show whether the pupils are fit to enter any of the universities, is very severe, and includes history, Latin and Greek, and at least one foreign language.

Gymnastics (jim-nas'tiks; for derivation, see *Gymnasium*) is the technical term used to designate any system of exercises specially designed to promote the development of physical, and especially of muscular powers. An excellent gymnastic training is given by cricket, football, rowing, and similar amusements, but the special value of formal gymnastic exercises is that they are capable of being scientifically arranged so as to secure not only a general development of muscular power, but also an accurate knowledge of the uses of the various muscles, and further that they are capable of being applied to each individual case, so as to meet, allow for, and as far as possible overcome, defects in physical organization. For these purposes an elementary course of gymnastics is of great value to all, especially to the sedentary student. In regard to gymnastic exercises two general rules may be laid down, which will form an efficient guide in self-imposed exercises. The first is the universal rule in mechanics that the strength of any machine is the strength of its weakest part; the second is the fundamental law of muscular exercise, that it is exercise within the extreme power of the muscle which develops and improves, while straining weakens and injures, and excessive exercise develops particular muscles abnormally at the expense of the general health. It is quite possible, indeed, to carry physical exercises as a whole too far, and to develop muscular power at the expense of vital strength. Till the age of twelve the ordinary games and pastimes of childhood are generally quite sufficient exercise; after that some very light system of gymnastics may be adopted to aid the development of the system. After the age of thirty-five unusual muscular efforts are apt to leave persistent strains, and moderate exercise becomes the safest means of developing and giving tone to the muscular system.

Gymnogen (jim'nu-jen), in botany, a plant with a naked seed. Among gymnogens are pines and firs, yews, joint-firs, the cycads, etc. In the gymnogens there is no proper ovary, the seeds being fertilised by the pollen coming into direct contact with the foramen of the ovule without the intervention of a stigma.

Gymnosperm (jim'nu-sperm), a plant with a naked seed; a gymnogen (which see).

Gympie (gim'pi), a municipal town of Australia, in Queensland, on the side of a range of hills overlooking the river Mary, 116 miles north of Brisbane. It owes its origin to the goldfields here which have yielded good results. The town has some good public buildings, well-paved streets, and is lighted by gas. Pop. 12,000.

Gynæceum (ji-nē'si-um), in botany, the pistil taken in a collective sense, precisely as the stamens form the androecium.

Gynecology (ji-ne-kol'ō-ji), that science which treats of diseases peculiar to women.

Gynandria (ji-nan'dri-a), the name given to one of the classes in the artificial system of Linnæus, characterized by having the stamens and pistil consolidated in a single body, as in orchids.

Gynerium (ji-nē'ri-um), a genus of grasses, of which the best known is *G. argenteum* or Pampas Grass (which see).

Gyöngyös (dyeun'dyeush), a town of Hungary, 44 miles N. E. of Budapest; it has manufactures of woolen stuffs, an active trade, and produces the celebrated Erlauer red wine. Pop. 16,442.

Gypaëtus (ji-pā'ē-tus), the genus of birds to which belongs the Bearded Vulture or Lämmergeyer of the Alps (which see).

Gypsies (jip'sēs; from *Egyptians*, the name by which they were called in the English statutes), a wandering nation, whose physical characteristics, language, and customs differ much from those of European nations. They are called by the French *Bohémiens*, from the belief that they were Hussites driven from Bohemia; in Germany the general name is *Zigeuner*, which is not unlike the Italian *Zingari*. They call themselves *Rommany*, from *rom* (man). This race is slowly melting away. Its present total number hardly reaches 500,000; of whom there are about 120,000 in European Turkey; 140,000 in Hungary; 60,000 in Transylvania; 40,000 in Spain; 40,000 spread

over Germany, France, and Italy; 18,000 in Britain, of whom, however, only a small number are tent-gypsies, preserving the language and traditions of their race; and the remainder scattered over other countries. The gypsies are now considered to have come from India, the main body of their language, though mixed with a great number of borrowed words, having a close affinity with some of the Indian languages. Gypsies are remarkable for the yellow brown, or rather olive color, of their skin; the jet-black of their hair and eyes, the extreme whiteness of their teeth, and generally for the symmetry of their limbs. The typical Gypsies rarely settle permanently anywhere, but live in tents, wandering about working in wood and iron, making domestic utensils, telling fortunes, practising tricks, etc. Their talent for music is remarkable, and some of their melodies have become the much-valued property of other nations, or are incorporated in some of our favorite operas. They have no peculiar religion. Amongst the Turks they are Mohammedans; and in Spain, at least, as well as in Transylvania, they follow the forms of the Christian religion, without, however, caring for instruction, or having any real interest in religion. The marriage ceremony is of the simplest kind. If the husband becomes tired of his wife, he will turn her off without ceremony. There is no idea of education amongst them. The children grow up in idleness and the habits of stealing and cheating. The Gypsies first appeared in Germany and Italy about the beginning of the fifteenth century. At that time they wandered about in hordes with a commander at their head. In the Austrian States, where they are very numerous, Maria Theresa formed the plan of converting them into orderly citizens. But her ordinances that they should dwell in settled habitations, practice some trade and send their children to school, remained to a large extent ineffectual. In England the Gypsies first appeared about the beginning of the sixteenth century, and notwithstanding severely repressive enactments on the part of the government continued to maintain themselves as tinkers, mat and basket-makers, etc. In Scotland they were more favorably received, and frequently intermarried with the natives. The town of Yetholm, in Roxburghshire, was once a sort of headquarters for the race, and almost exclusively inhabited by Gypsies. Considerable numbers of the British Gypsies have emigrated to America, where they settle amongst the people and lose their distinctive characteristics. With regard to their language, a large number of the words in all the different dialects are of Indian origin, as already mentioned. The grammar of the tongue is also oriental, and corresponds with the Indian dialects. This similarity cannot be considered the work of chance, particularly as their persons and customs show much of the Hindu character. Amongst the chief authorities in the English language on the subject of the language and origin of the Gypsies are: George Borrow's account of the *Gypsies in Spain* and *Romano Lavosil;* C. G. Leland, the *English Gypsies and their Language;* and Smart and Crofton, the *Dialect of the English Gypsies.*

Gypsum (jip'sum), a monoclinic mineral, chemically a hydrated calcic sulphate ($CaSO_4.2H_2O$). It is found in a compact state as *alabaster*, or crystallized as *selenite*, or in the form of a soft chalky stone, which in a very moderate heat gives out its water of crystallization, and becomes a very fine white powder, extensively used under the name of plaster of Paris (which see). This last is the most common, and is found in great masses near Paris, where it forms the hill of Montmartre, near Aix in Provence, and near Burgos in Spain. Gypsum may be geologically of any age, but occurs abundantly in the more recent sedimentary formations, and is even now forming. When gypsum occurs without water it is called *anhydrite*, but in its most ordinary state it is combined with water.

Gypsy Moth, a small brown moth, *Porthetria Dispar*, common in Europe, where it is not very harmful, and a pest in America since its accidental introduction into New England about 1870. It eats the foliage of trees, sometimes destroying whole forests. Since 1890 extensive public measures have been taken for its extermination, but with little success. The moths live by preference on oaks, apples, gray birch and willows, but will not thrive on white pine. Accordingly, owners of forests where direct control of the pest would be impossible because of the expense are advised to cut down their trees and plant white pine instead.

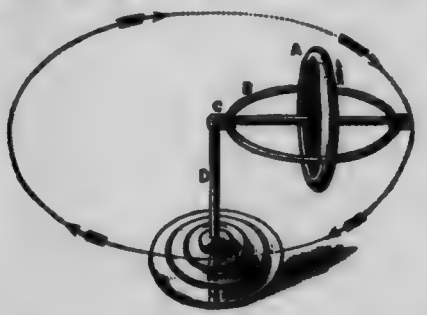
Gypsy-wort, *Lycŏpus Europæus*, a labiate plant found in Britain in ditches and on river banks. It yields a dye said to be used by the Gypsies to render their skin darker.

Gyrencephala (ji-ren-sef'a-la), one of the four subclasses into which Owen divided the mammalia, characterized by having the hemispheres of the cerebrum covering the greater part of the cerebellum and the olfactory lobes. It comprehends the Quadrumana, Carnivora, Artiodactyla, Perisso-

dactyla, Proboscidea, Sirenia, and Cetacea.

Gyrfalcon, or JERFALCON (jer-falkon). See *Falcon*.

Gyroscope (jī'ro-skōp), an apparatus, consisting of a rotating disc mounted by very accurately fitted pivots in a ring or rings (forming a sort of gimbals), for illustrating the properties of rotation generally. The fundamental principle of the whole is the resistance which a disc in rapid motion presents to any change of direction in the axis of rotation. Some curious phenomena may be exhibited by it difficult to explain without resorting to mathematical formulæ. The figure shows a simple gyroscope. If the disc A, which revolves on



Gyroscope.

an axis within the ring B, is set very rapidly in motion by the unwinding of a string round the axis, and if the part C is then rested on a pivot at the top of the upright support D, the apparatus instead of falling will go slowly round in the direction shown by the arrows. The gyroscope, on a large scale, has been utilised to give steadiness to vessels in rough seas and is considered as applicable to the aeroplane, to keep it on a fixed level. One of the most successful of the recent applications of the gyroscope is in its connection with the marine compass. All battleships in the United States Navy are fitted with the gyro compass. As a gyro compass is independent of the magnetism of the earth and of the ship, and, when running properly, always points to the North Pole, its great convenience in vessels carrying heavy guns and armor is at once apparent. Another important use of the gyroscope is found in its relation to the naval torpedo, especially the Whitehead pattern. Its first application to this purpose was made by an officer in the Austrian navy in 1895, and this device or an improved modification of it, such as the Angle Gyroscope invented by Lieut. W. I. Chambers, of the United States Navy, is in use on all torpedoes. See *Torpedo*. Another interesting application of the gyroscope is in the Gyroscope Railway, which see.

Gyroscope Railway, a railway with a single line of rails, on which the car is kept erect by the steadying power of a pair of heavy gyroscopes, or fly wheels, rotating in opposite directions at very high velocity. There are two recent inventions of this kind, an English and a German, practically the same in character. The English, the invention of an Australian named Brennan, had its first form in a model, a small car on which the gyroscopes rotated at the enormous speed of 7500 revolutions per minute. They were hung in special bearings and rotated in a partial vacuum, the friction being so slight that the wheels would continue to revolve and give stability to the car for a considerable time after the power was shut off. Also, in such a case, supports at the side kept the car from overturning. This model showed itself capable of traveling at high speed on a single rail, rounding sharp curves, and even traversing with ease a wire cable hung in the air. In 1909 a car was tried 14 feet long and 10 wide, capable of carrying 40 passengers. The gyroscopes in this, moved by a gasoline engine, revolved in a vacuum at a speed of 3000 rotations per minute. They were 3½ feet in diameter and weighed together 1½ tons. With a full load of passengers this car sped easily around a circular rail 220 yards long, and proved that it could not be upset, since when all the passengers crowded to one side the car remained firmly erect, the gyroscopes lifting it on the weighted side. It is claimed that in the monorail system a speed of more than 100 miles an hour is safely possible. The German invention, displayed by Herr Schorl, a capitalist of Berlin, is in many respects like the English one. The experimental car was 18 feet long and 4 wide, the gyroscopic fly wheels being very light, weighing but 125 pounds each, while their speed of rotation was 8000 per minute. The same success was attained as in the English experiments, and there seems to be a successful future before this interesting vehicle of travel.

Gyula-Fehérvár. See *Carlsburg*.

H

H, the eighth letter of the English alphabet, often called the *aspirate*, as being a mere aspiration of breathing, though not the only aspirated letter in English. The sound that distinctively belongs to it is that which it has at the beginning of a syllable before a vowel, as in *hard, heavy*. It is very commonly joined to other consonants to represent sounds for which there are no special letters in the alphabet, as in the digraphs *ch*, *sh*, *th* (*child, ship, thin, this*), or in other consonantal combinations of various origins and values, as in the words *enough* (*gh*=*f*), *plough* (*gh* silent), *philosophy* (*ph*=*f*), *rhetoric* (*h* silent), etc. *Ch* is common in words taken from the Greek, but in this case it generally has the *k* sound, as in *chemistry, chyle, logomachy*, etc. See *Grimm's Law*.

Haakon VII. See *Hakon VII.*

Haarlem (här'lem), a town of Holland, province N. Holland, 10 miles W. of Amsterdam, intersected by the Spaarne, which is joined by canals from Leyden and Amsterdam, and along which a considerable traffic is maintained. The town is well and regularly built; the streets exceedingly clean, planted with trees, and laid out in promenades. Among the notable buildings are the town-hall, the church of St. Bavon with its celebrated organ, the Prinsenhof, in which the provincial assembly meets. The manufactures of Haarlem, as well as its population, are less than what they were formerly; but it has still various industrial works, a celebrated type-foundry, the oldest and most famous printing-office in Holland, while its flower trade, especially in hyacinths and other bulbs, is very important. On the south side of the town is the park of Haarlem, a plantation of fine old beeches surrounded with villas, cafés, and places of holiday resort. Haarlem was a prosperous place as far back as the twelfth century. During the revolt of the Netherlands it sustained a famous seven months' siege by the Spaniards. It is the birthplace of Laurence Coster, and of the painters Ostade, the Wouvermans, Ruisdael, etc. Pop. 70,491.

Haarlem (här'lem), LAKE OF, a former lake of Holland, adjoining and communicating with the Y, between Haarlem and Amsterdam. Previously a swamp, it was formed in the fifteenth century by the overflow of the Rhine and the crumbling away of the banks of the Y, and imperiled by its growth the towns of Haarlem, Amsterdam, and Leyden. It was 18 miles long, 9 miles broad, and about 14 feet deep. The draining of it was commenced in 1840, and completed in 1853. The soil thus reclaimed, known as the Haarlemmer Polder, now forms a commune, which numbers over 16,000 inhabitants.

Habakkuk (hab'a-kuk, or ha-bak'-uk), the eighth of the twelve minor prophets. He flourished about 600 B.C. at the time of the invasion of Judah by the Chaldeans, against whom he prophesies God's retributive justice. He concludes with a kind of psalm (chap. 3) remarkable for the majesty of its language and the sublimity of its thought.

Habberton (hab'ėr-tun), JOHN, author, born at Brooklyn, New York, in 1842. He served as an officer in the Civil war, 1862-65, and afterwards became a journalist and novelist. His *Helen's Babies* (1876) was a very popular story. Other books are: *The Worst Boy in Town, Who Was Paul Grayson, A Lucky Lover*.

Habeas Corpus (hā'be-as kor'pus), in law, a writ addressed to one who has a person in custody, commanding him to produce the body of the person named at a certain place and time. From the time of the Magna Charta imprisonment at the discretion of any person has been unlawful in England, but for long the royal prerogative was so indefinite and the power of the crown so great that persons were frequently detained in custody at the discretion of the crown. It was not till 1679 that the Habeas Corpus Act provided the great remedy for the violation of personal liberty by the writ of *habeas corpus ad subjiciendum* (that you have the body to answer). The provisions of the act may

be stated generally thus:—1. That on complaint or request in writing, by, or on behalf of, any person committed and charged with any crime (unless treason, felony, etc., expressed in the warrant), the lord-chancellor, or any of the judges shall award a habeas corpus for such prisoner, and shall discharge the party, if bailable, upon security being given to appear and answer to the accusation. 2. The writ shall be returned, and the prisoner brought up within a limited time, not exceeding twenty days. 3. No person once delivered by habeas corpus shall be recommitted for the same offence. 4. Every person committed for treason or felony may insist on being tried at the next assizes, or admitted to bail, and if not tried at the second assizes or sessions, he shall be discharged from the imprisonment. The English statute has been copied in the United States without essential change. It is the grandest safeguard against despotism which jurisprudence affords. In the days of slavery the writ was often issued in behalf of slaves who had escaped from their masters, and when it was shown that the masters had brought them into a free state the court set them free. So important was the writ of habeas corpus considered by the framers of the constitution of the United States that they inserted an express provision (art. I, sec. 9) that it should not be suspended 'unless when in cases of rebellion or invasion the public safety may require it.' The question whether the power to suspend is vested in Congress or the President, or in each alike, is a disputed point. During the Civil war the power was exercised by the president, with the tacit consent or express permission of Congress. No state court has a right to issue the writ for the discharge of a person held under the authority of the federal government. The proceedings upon a return of a writ may take place in chambers before a single judge, or before several judges in open court, as determined by the language of the writ.

Habergeon (ha-bèr'jun), a jacket of hain-mail shorter than the hauberk, and without sleeves, worn during the middle ages by the squires and archers.

Habibulla Khan, Ameer of Afghanistan, born at Cabul in 1872, succeeded his father, Abdur Rahman Khan, October 3, 1901.

Habitants, or HABITANS, a name applied to the inhabitants of Canada, especially in Quebec province, who are of French extraction and still speak the French language and preserve French customs. See *Canada*.

Hackberry (hak'ber-i), the popular name of North American varieties of the nettle-tree, *Celtis crassifolia*, also of the *Celtis occidentalis*, belonging to the nettle family Urticaceæ.

Hackensack (hak'en-sak), a town, capital of Bergen County, New Jersey, 12 miles N. of New York, and with manufactures of paper boxes, silk, wall-paper, etc. Many New York business men reside here. Pop. 15,000.

Hackländer (hak'len-dèr), FRIEDRICH WILHELM VON, a German novelist and comedy writer, born in 1816. He engaged first in commerce, then entered the Prussian artillery, and commenced his literary career in 1841 with *Pictures from a Soldier's Life in Time of Peace*. He then became successively private secretary to Baron Taubenhein, whom he accompanied to the East, and to the Crown Prince of Würtemberg. In 1849 he served with the Austrians during the war with Sardinia, and published his observations in *Soldier Life in Time of War*. He was ennobled by the Emperor Francis Joseph. He died in 1877. Amongst his many writings distinguished by a mixture of pathos and humor, we may mention *Daguerreotypen* (1842), *Handel und Wandel* (1850), *Der Neue Don Quixote* (1858), *Geschichten im Zickzack* (1871); of his comedies, *Der Geheime Agent* (1850) was the most successful.

Hackmatack (hak'ma-tak), a term applied in many parts of the United States to the American larch. See *Larch*.

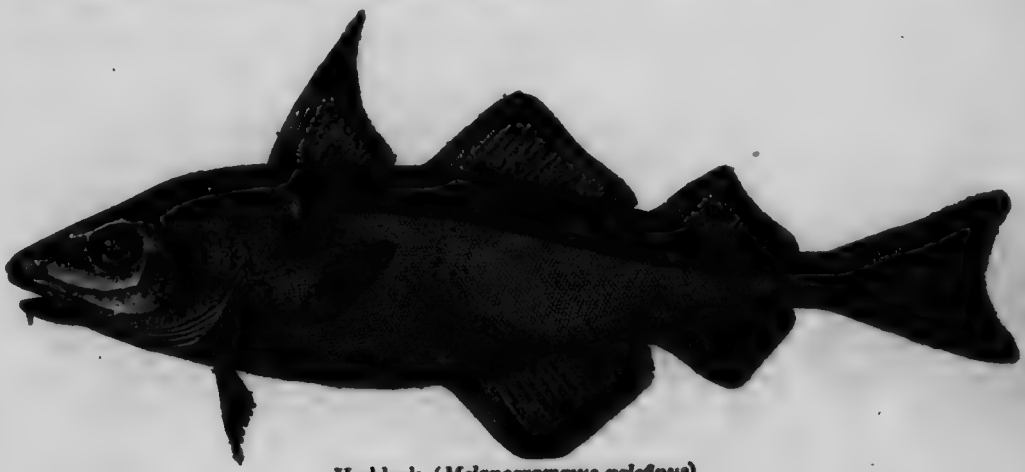
Hackney (hak'nē), a suburb of London, in Middlesex, 3 miles N. N. E. of St. Paul's. It includes Hackney proper, South Hackney, Homerton, Clapton, Dalston, etc., and is a favorite residence of wealthy merchants. Pop. 222,587.

Hackney Coach, a coach let out for hire. Hackney coaches began first to ply under this name in London in 1625, when they were twenty in number. Hackney coachmen are generally put under police regulations, and a tariff of fares imposed upon them. Cabs are now the common kind of hackney coaches.

Haddington (had'ing-tun), a burgh of Scotland, capital of the county of same name, 17 miles east by north of Edinburgh, on the Tyne. The town has a Gothic church of the eleventh or twelfth century. Its grain market is one of the largest in Scotland. Pop. 5125.—The county, also called EAST LOTHIAN, is bounded by the Firth

of Forth, the German Ocean, Berwickshire, and Midlothian; area, 280 square miles, of which four-fifths are arable or fit for cultivation. The Lammermuir Hills yield coal, iron, and limestone. Fishing and fish-curing are carried on at Dunbar and other points. Pop. 38,662.

Haddock (had'uk), a well-known fish of the cod family (Gadidæ), *Morrhua* (*Gadus*) *æglefinus*. It is smaller than the cod, which it much resembles, but it has a dark spot on each side of the body just behind the head. This fish commonly weighs from 2 to 6 lbs., though sometimes as high as 10 lbs.



Haddock (*Melanogrammus æglefinus*).

It breeds in immense numbers in the northern seas in February and March, and constitutes a considerable article of food. It is plentiful on the coasts of America, from New York to the Arctic regions.

Hadersleben (hä-dĕrs-lā'ben), a town of Prussia, in Schleswig-Holstein, on the Hadersleben Fiord, in the Little Belt. Pop. 9201.

Hades (hā'dēz), originally the Greek name of the lord of the lower or invisible world, afterwards called Pluto; but in later times, as in the Greek Scriptures, it is applied to the region itself. With the ancients Hades was the common receptacle of departed spirits, of good as well as bad.

Hadji (ha'jē), the Mohammedan pilgrimage to Mecca, which every Mohammedan ought to perform once in his life, and after which he is entitled to prefix *Hadji* to his name. The pilgrimage was made in disguise by Burckhardt in 1814, by Burton in 1853, and by T. F. Keane in 1878, each of whom published accounts of his journey.

Hadji Khalifah (ha'jē kal'i-fa), the surname of Mustapha-Ben-Abdallah, a Turkish historian, born at Constantinople about 1605; became 'first secretary' to Sultan Mourad IV, and died at Constantinople in 1658. His most important work is *Keshf-ul-tzunûn*, a kind of encyclopædia of Arabic, Turkish, and Persian literature. Among his other works are *Chronological Tables*, *Mirror of the World*, and *History of the Maritime Wars of the Turks*. All the works mentioned above have been translated into Latin and modern languages.

Hadley (had'li), ARTHUR TWINING, an American educator; born in New Haven, Connecticut, in 1856. He graduated at Yale College in 1876; became professor of political science in 1886 and president of Yale University in 1899. He accepted the Roosevelt professorship at Berlin, 1907-08.

Hadley (had'li), JOHN, an English astronomer, born towards the end of the seventeenth century. He is the reputed inventor of the quadrant that goes by his name, though the honor is also claimed for Newton, from whom Hadley got a description of the instrument in 1727, and for Thomas Godfrey, of Philadelphia, who produced his instrument about the same time as Hadley, in 1731. The Royal Society decided that Godfrey and Hadley were both entitled to the honor of the invention. Hadley also invented the sextant. He died in 1744.

Hadramaut (hä-drä-mą'), a district of Arabia which, in the older and wider use of the term, extended from Yemen on the west to Oman on the east, and from the Indian

Ocean on the south to the great desert of El Ahkaf on the north. The name is, however, generally confined by the natives to a much smaller tract in the southwest. There are some fertile valleys and glens, one of the most important being that of the Wadi-Doan, where the slopes of the mountains are covered with towns and villages, and grain crops, dates, indigo, bananas, etc., are extensively cultivated. On the coast Makallah is the chief commercial depôt.

Hadrian (hā'dri-an), in full, PUBLIUS ÆLIUS HADRIANUS, the fourteenth in the series of Roman emperors, born at Rome, 24th Jan., 76 A.D. His father, who was cousin to the Emperor Trajan, died when he was ten years old, and left him under the charge of his illustrious kinsman. He married Sabina, Trajan's grandniece, accompanied the emperor on his expeditions, filled the highest offices of state, and, on the death of Trajan, assumed the government as his adopted son (117). He made peace with the Parthians, renouncing all conquests east af the Euphrates, and bought off a war with the Roxolani by payment of a sum of money. From the year 121 he spent most of his time in visiting the various provinces of the empire. Hadrian's policy was a peaceful one, because he saw that the further extension of the empire only weakened it. Although avoiding war as much as he could, he kept the armies in excellent condition, fortified the frontiers in Germany, and, crossing over into Britain, constructed the wall known as Hadrian's Wall (or that of Severus), which protected the Roman province from the barbarous tribes of the north. He next traveled into Asia and Africa, and lived in Athens for three years. In 131 he promulgated the Edictum Perpetuum, a fixed code of laws, which forms an important epoch in the development of Roman law. In 132 the Jews began a revolt, and for four years carried on a bloody war, the only notable one of his long reign. Hadrian died at Baiæ in 138.

Coin of Hadrian.

Hadrian's Wall, or the PICTISH WALL, a wall quite as often associated with the name of Severus. See *Severus (Wall of)*.

Hadrosaurus (ha-dro-sa'rus), a genus of large extinct reptiles, whose remains have been found in the newer cretaceous strata of the United States. A fine example, found in New Jersey, is in the Philadelphia Academy of Natural Sciences. It appears to have resembled the gigantic iguanodon of Europe in its enormous dimensions, herbivorous habits, and anatomical structure.

Hæckel (hek'l), ERNST, a German naturalist, born at Potsdam in 1834, studied medicine and science at Berlin, Würzburg, and Vienna; traveled in Norway and Italy, became professor of zoology at Jena in 1865. Later he visited Spain, Egypt, India, and Ceylon to perfect his knowledge of natural forms. He is the most prominent exponent of the Darwinian theories and of the doctrine of monism in Germany. Among his works may be mentioned *The Radiolaria* (1862), *The History of Creation* (1868), *Anthropology* (1874), *History of the Evolution of Man* (1875), *Riddle of the Universe* (1902), *and Wonders of Life* (1905). He died August 9, 1919.

Hæmal Cavity (hē'mal), in anatomy, a term applied to the cavity which contains the great centers of circulation in the Vertebrata, together with the digestive and respiratory apparatus. The *Hæmal Arch* is the arch formed by the projections anteriorly of the ribs and the sternum from the vertebræ.

Hæmatemesis (hē-ma-tem'e-sis), a vomiting of blood from the stomach, resulting from some disease of the stomach, as ulcer or cancer.

Hæmatin HEMATINE (hē'ma-tin), the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

Hæmatite (hē'ma-tit), RED AND BROWN. See *Hematite* and *Iron*.

Hæmatopus (hē-mat'o-pus), a genus of wading birds, the best known species of which is *H. ostralegus*, or common oyster-catcher.

Hæmatoxylin (hē-ma-toks'i-lin; $C_{16}H_{14}O_6$), the coloring matter of logwood, or *Hæmatoxylon campechianum*. This coloring matter is a constituent part of all the colors prepared with logwood, and the changes which it undergoes by the action of acids and alkalies render it useful as a reagent to detect their presence.

Hæmatozoa (hē-ma-tō-zō'a; Gr. *haima*, blood, and

zoön, a living creature), a name given to the parasitic animals which, under certain conditions, exist in the blood of mammals, birds, reptiles, fishes, and many invertebrate animals. They are generally microscopic, and are thought to be connected with various diseases.

Hæmaturia (hē-ma-tu'ri-a; Gr. *haima*, blood, and *ouron*, urine), a discharge of bloody urine, usually arising from disease of the kidneys or bladder. In some parts of Africa it is an endemic disease arising from a parasite in the blood.

Hæmoglobin, HÆMOGLOBULIN (hē-mo-glob'ū-lin), the semifluid or quite fluid matter of a red color contained in the red corpuscles of the blood. It can be resolved into an albuminous substance called globulin and the coloring matter hæmatin.

Hæmoptysis (hē-mop'ti-sis; Gr. *haima*, blood, and *ptysis*, a spitting), the coughing up of blood, sometimes produced by fullness of the blood vessels of the lungs or throat, or by the rupture of blood vessels as a consequence of ulceration. It is distinguished from blood coming from the stomach by the comparative smallness of its quantity, and by its usually florid color. It occurs in heart disease, in pneumonia and tubercular disease of the lungs. It is sometimes a case of vicarious menstruation.

Hæmorrhage. See *Hemorrhage.*

Hæmorrhoids. See *Hemorrhoids.*

Hæmus (hē'mus), in ancient geography, the chain of mountains now known as the *Balkan.*

Hafid (hä'fid), MULAI, Sultan of Morocco, born in 1873, the half brother of Sultan Abdel Aziz, educated at University of El Azaar, Cairo. He was viceroy of Southern Morocco for seven years, and in 1907 put himself at the head of the rebellion against Sultan Aziz, whose course of life had caused great dissatisfaction. After a struggle lasting about a year the revolution succeeded, Aziz was dethroned, and Hafid proclaimed sultan, February 11, 1908.

Hafiz (hä'fiz), MOHAMMED SHEMS ED DIN, one of the most celebrated and most charming poets of Persia, was born at Shiraz in the beginning of the fourteenth century. He studied theology and law, sciences which, in Mohammedan countries, are intimately connected with each other. He preferred independent poverty as a dervish to a life at court, whither he was often invited by Sultan Ahmed, who earnestly pressed him to visit Bagdad. He died at Shiraz about 1390. His poems, known collectively as the *Divan*, are Anacreontic in sentiment, abounding in the praise of love and wine.

Haggar. See *Ahaggar.*

Hag, the name of the fishes of the genus *Myxine*, which, with the allied lampreys, constitute the order of Marsipobranchii. They are of worm-like form, and have no eyes or scales. The mouth is formed for suction, is without lips, and furnished with fleshy filaments or barbels. There is a single median fang upon the palate, by means of which the hag makes its way into the interior of other fishes, such as the cod, ling, or haddock, where it lives parasitically. The *Myxine glutinosa*, or common hag, takes its name from the quantity of viscid mucus which it can secrete. An American species is not uncommon in rivers of New York and New England.

Hagen (hä'gen), a thriving manufacturing town of Prussia, in Westphalia, at the confluence of the Volme and Ennepe. It has manufactures of woolen, linen, and cotton cloth, leather, hats, steel, and ironware. Pop. 88,605.

Hagenau (hä'gē-nou), a town of Germany, Lower Alsace, 18 miles north of Strasburg, on the Moder. It has some manufactures in woolen and cotton goods, soap, etc., and a considerable trade in grain, oil, hops, etc. Pop. 17,968.

Hagerstown (hā'gèrs-toun), a city, county seat of Washington County, Maryland, 22 miles N. W. of Frederick, on several railroads. It is an active manufacturing town, with varied industries, including wood-working plants, textile mills, metal working industries, railroad shops, etc. Pop. 16,507.

Haggai (hag'ā-i), the tenth in order of the minor prophets, and first of those who prophesied after the captivity. The book of Haggai consists of four distinct prophetical addresses—two in the first and two in the second chapter—intended to rouse his disheartened countrymen to the rebuilding of the temple. They were delivered in 520 B.C., and are written in a brief style. The closing prediction foreshadows the establishment of the Messianic kingdom.

Hagiographa (hā-ji-ag'ra-fa), a term from the Greek, meaning in general holy writings, but specifically applied to the writings included in the Jewish Ketubim, or third division of the Scriptures. See *Bible.*

Hagiology (hā-ji-ol'o-ji), that branch of literature

which has to do with the history of the lives and legends of the saints.

Hague, THE (hāg; Dutch, *'S Gravenhage*—the Count's Hedge; French, *La Haye*), practically, though not formally, the capital of the Netherlands, in the province of South Holland, 33 miles southwest from Amsterdam, and within 3 miles of the sea. It is the residence of the queen and of the foreign ambassadors, and the seat of the States-General of the Netherlands. It is pleasantly situated, and is distinguished for width and straightness of streets, and general elegance of public buildings. Among the most important structures are the royal palace, the palace of the Prince of Orange, the Binnenhof, a large irregular building, founded in 1249, and containing the hall of assembly of the States-General, and various government offices; also the provincial government house, a large roomy edifice, the town hall, royal library (200,000 vols.); the Groote Kerk, or Church of St. James, with hexagonal tower and finely vaulted interior; the Mauritshuis, built by Prince John Maurice of Nassau, now converted into a museum containing some of the finest works of the Dutch masters. To these has recently been added the so-called 'Palace of Peace,' built by Andrew Carnegie for the meetings of the International Peace Conference. There are some manufactures—iron, ordnance, gold and silver wares, hats, furniture, etc.—but the town mostly depends on the presence of the court and the numbers of strangers that come for sea-bathing to Scheveningen, about 3 miles distant. The population in 1900 was 212,211; it had increased to 294,693 in 1913.

Hague Tribunal. See *Peace, International.*

Hahnemann (hä'nė-mán), SAMUEL CHRISTIAN FRIEDRICH, the founder of the homœopathic system, born at Meissen in 1755; studied medicine at Leipzig, Vienna, and Erlangen, taking his degree at the last-mentioned place in 1779. After practicing in various places, he published in 1810 his *Organon der rationellen Heilkunde*, which fully explained his new system of curing any disorder by employing a medicine which produces a similar disorder. (See *Homœopathy.*) Hahnemann was driven from Saxony by the government prohibiting him from dispensing medicines, but found an asylum ultimately in Paris, where his system was authorized by the government and acquired a certain popularity. In its developed form it now ranks among the prominent schools of medicine. He died at Paris in 1843.

Haig, SIR DOUGLAS, British general, born in Fifeshire in 1861, entered the hussar service in the army in 1885 and took part in 1888 in the Sudan campaign under Kitchener. In the Boer War he served as a staff officer and won repute for skill and courage, reaching the rank of lieutenant-colonel. He was inspector general of cavalry in India in 1903 and major general in 1904, was chief of staff in India 1909–13, and in 1914 was made commander of the First Army on the France-Belgium line. He showed brilliant powers on the Aisne and at Ypres and in 1916 succeeded General French as commander-in-chief of the British forces in France.

Hail (hāl), small masses of ice or frozen rain falling from the clouds in showers or storms, varying in their form, being either angular, pyramidal or stellated, as well as in their consistency, being sometimes as hard as ice and sometimes as soft as snow. At

FORMS OF HAILSTONES.

Fig. 1. *a*, Hailstone which fell at Bonn in 1822: diameter 1¼ inches, weight 300 grains. *b c*, Sections of differently shaped Hailstones which fell on the same occasion. Fig. 2. *a*, Section of Hailstone with minute pyramids on its surface. *b c d e*, Fragments of same when burst asunder.

the center there is generally an opaque spongy mass, resembling sleet in its composition, and round this a semi-transparent congealed mass, consisting of a succession of layers or strata, is formed. Properly there are two kinds of hail—the small grains which generally fall in winter and usually before snow; and the large hail which occurs chiefly in spring and summer, and is most severe in very hot climates. The small-grained hail is probably formed by the freezing of raindrops as they pass in falling through colder air than that from which they started. The large or common hail is probably due to the meeting of two currents of air, of very unequal temperature and electric tension. The usual size of hailstones is about ¼ inch in diameter, but they are frequently of much larger dimensions, sometimes even 3 or 4 inches

in diameter. In hot, and even in temperate climates they are often very destructive to crops.

Hailes, LORD. See *Dalrymple* (*Sir David*).

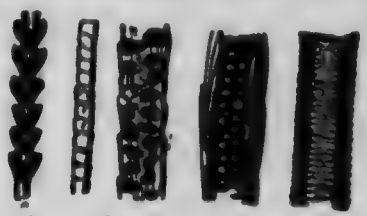
Hainan (hī'nän), an island of China, belonging to the province of Quang-Tung, between the China Sea and the Gulf of Tonquin, and separated from the mainland by a channel of 15 miles, encumbered with shoals and coral reefs. It is almost oval in shape, and has an area of over 16,000 square miles. The fertile lowlands on the northern and western coasts are occupied by immigrant Chinese, to the number of about 1,500,000, who cultivate rice, sugar, tobacco, etc. The fisheries are also productive. The interior, which is mountainous and covered with forests, is inhabited by a distinct race still in a very primitive stage. The capital is Kiang-chow, on the northern coast, a large seaport.

Hainaut, or HAINAULT (ā-nō; Dutch, *Henegouwen*; German, *Hennegau*), a province of Belgium, bounded on the south and west by France; area, 1406 square miles. Though nowhere properly mountainous, it is very hilly in the southeast, where it is covered by the Western Ardennes. In other directions it is generally flat, though well diversified. About three-fourths of the whole surface is arable, and scarcely a hundredth part is waste. The soil is generally fertile, and there are extensive coal fields, coal, together with flax, linen, hemp, tobacco, and porcelain being the chief articles of export. Manufactures, chiefly cutlery, woolen and linen goods, etc., are carried on to a great extent. The capital is Mons. Population, 1,146,646. The old province of Hainault, in Cæsar's time the native district of the Nervii, was in the tenth century governed by a race of counts, the succession of which continued unbroken till 1436, when Jacqueline, heiress of William IV, was forced to cede her lands to Philip, duke of Burgundy. With Mary of Burgundy, Hainault passed to the house of Austria, but in 1659 a part of it was ceded to France, and is now included in the department of Nord.

Hainburg, or HAIMBURG (hīn'bŭrk, him'bŭrk), a town of Lower Austria, beautifully situated on the Danube, 27 miles southeast of Vienna. It is walled; has an ancient town house, remains of a Roman aqueduct, and other antiquities. The old castle on the height is the Heimbure of the Nibelungenlied, the old frontier fortress of the Huns. Pop. 6225.

Hainichen (hī'nĭk-en), a town of Saxony, 41 miles southeast of Leipsig. It has manufactures of woolen, linen, and cotton cloth, and is the chief seat of the German flannel manufacture. Pop. 7932.

Hair (hār), the fine, threadlike, more or less elastic substance, of various form and color, which constitutes the covering of the skin in the class of mammalia. It has the same use as feathers in birds, and scales in fishes and reptiles. No species of mammalia is without hair in an adult state, not even the Cetacea. In quadrupeds it is of the most various conformation, from the finest



A B C D

HAIRS OF VARIOUS ANIMALS MAGNIFIED.
A, Indian bat. B, Mouse. C, Sable. D, Human.

wool to the quills of a porcupine or the bristles of the hog. The human body is naturally covered with long hair only on a few parts; yet the parts which we should generally describe as destitute of it produce a fine, short, colorless, sometimes hardly perceptible hair. The only places entirely free from it are the palms of the hands and the soles of the feet; but the body of the male often produces hair like that of the head on the breast, shoulders, arms, etc. Each hair consists of a shaft and a root. The shaft or part outside the skin does not grow; but the root embedded in the skin expands at its lower end into a swelling or bulb which is composed of little cells and grows by forming new cells, the old ones being pressed forward and becoming part of the shaft. The color is due to minute pigment granules in the cells of the hair. The color of the hair is a race character; and the shape of the shaft has likewise been used in this way, transverse sections showing circular, oval, flat, or reniform outlines. The human hair varies according to age, sex, country, and circumstances. At birth an infant generally has light hair. It always grows darker and stiffer with age. The same is the case with the eyelashes and eyebrows. At the age of puberty the hair grows in the armpits, etc., of both sexes, and on the chin of the male. The hair of men is stronger and stiffer; that of

females longer (even in a state of nature), thicker, and not so liable to be shed. Connected with the hairs are small glands which secrete an oily substance, serving as a lubricant to the skin as well as the hair. These are called sebaceous glands. If the root is destroyed there is no means of reproducing the hair; but if it falls out without the root being destroyed, as is often the case after nervous fevers, the hair grows out again of itself. Each hair, indeed, lasts only a certain time, after which it falls out and is replaced by another as long as the papilla is not weakened. Grayness of hair is caused by a deficient amount of pigment granules in the hair cells. The deficiency arises at the hair bulb where the cells are produced. Any influences that affect the nutrition of the bulb may thus affect the color as well as the growth of the hair. Baldness is caused by atrophy of the papilla, generally due to lessened circulation of the blood in the scalp. For some diseases which have a close connection with the hair, see *Plica Polonica*, *Ringworm*, *Sycosis*. Under ordinary circumstances hair is a very stable substance. It is the last thing which decays, and it often grows after death and lasts for centuries. Hair is not acted on by water, but heated in it under pressure it decomposes, evolves sulphuretted hydrogen, and dissolves; it is also dissolved by alkalies and acids. When burned it emits a disagreeable odor as of burning horn.

Hair for manufacture is furnished chiefly from the horse, the ox, the hog, the goat, especially the Angora or Mohair goat, the camel, and the alpaca. That of the first three is most used for upholstery purposes, the short hair being manufactured into curled hair for stuffing, and the long straight hair manufactured into hair-cloth for seating. The long hair is also reserved for the manufacture of fishing-lines, brushes, etc. White hair is of the most value, being most adapted for dyeing and for the manufacture of fancy articles. The horse-hair used for weaving comes chiefly from Russia, Germany, Belgium, South America, and Australia. Russia chiefly furnishes the bristles, so largely used for brushes. The sable, the minniver, the marten, the badger supply the finer brushes or hair-pencils of painters. The hair of the goat, the camel, and the alpaca is chiefly used in combination with or subordinated to wool and other fibers for spinning and weaving into dress fabrics. The kind of hair most used in manufacture is the fleecy coat, or soft hair of the sheep, known as wool (*q. v.*). Human hair is used chiefly for the manufacture of wigs, curls, beards, chignons, etc. Most of the supply comes from France, Germany, and Italy, where the peasant girls sell their hair to itinerant dealers. In every case, and for any purpose, hair is always best taken from the healthy living subject, hair of diseased and dead people being much inferior.

Hair-dyes, substances for giving hair some particular color desired. The numerous preparations sold for this purpose have generally a basis of lead or nitrate of silver. Bismuth, pyrogallic acid, sulphur, the juice of green walnut shells and other astringent vegetable juices, are also employed.

Hair-eel, the living form into which horse-hairs, when left to soak in running water, are supposed by many to develop. The horse-hair worm or hair-eel is really a Nematode. See *Nemathelmia*.

Hair-grass (*Aira*), a genus of grasses belonging to that division of the order in which the spikelets have two or more florets, and the inflorescence is a loose panicle. It is of little use for cattle, which dislike it, but may serve where covert is wanted for game. *A. cæspitosa*, or tufted hair-grass, the windlestrae of the Scotch, is used as thatch for ricks, and in some places for making mats.

Hair-powder, a preparation of pulverized starch and some perfume, formerly much used to whiten the head. Sometimes the powder was colored. The custom of wearing it was introduced from France into England in the reign of Charles II. To make the powder hold, the hair was usually greased with pomade. It is now scarcely to be seen except on the heads of footmen in attendance on the people of rank or wealth.

Hair-spring, in watches, the fine hair-like spring made of steel, which is attached to the axle of the balance wheel, and serves by its resisting power to equalize the vibrations of the escapement-wheel.

Hair-tail (*Trichiurus*), a genus of acanthopterous fishes, of the tropical marine fauna, generally found near land. The body is long, scaleless, ribbon-shape, and ends in a long, whip-like tail. The dorsal fin extends along the whole back and is spiny throughout. There are six species known, some of them being four feet long. The Dilvery Hair-tail, or Ribbon-fish, is found in the Atlantic, along the east coast of the United States from Cape Cod to Florida and in the West Indies. The others are found in Pacific waters.

Hair-worms. See *Nematelminthes*.

Haiti. See *Hayti*.

Hajilij (hă'ji-lij), an Egyptian, Indian, and African tree of the genus *Balanites* (*B. Ægyptiaca*), nat. order Simarubeæ, cultivated for its edible fruit, from the seeds of which an oil is expressed.

Hajipur (hă-jē-pör'), a town of India, in the Muzaffarpur District, Bengal, on the Little Gandak, a short distance above its confluence with the Ganges. Its command of water traffic gives it considerable commercial importance. Pop. about 20,000.

Hake (hāk), the *Merlucius vulgaris* of Europe, and the *M. albidus* of N. America, fishes belonging to that

Hake (*Merlucius vulgaris*).

division of the cod family or Gadidæ, which has the head much flattened, and two dorsal and one long anal fin. The European hake is known in some places as king of the herrings, on which it preys.

Hakim (ha'kim), a Turkish word, originally signifying *sage, philosopher*, and then a *physician*. *Hakim bashi* is the physician of the sultan, that is to say, the chief of the physicians, always a Turk; whilst the true physicians in the seraglio under him are Western Europeans, Greeks, and Jews.

Hakluyt (hak'lŏt), RICHARD, one of the earliest English collectors of voyages and maritime journals, born in 1553. He entered Christ Church College, Oxford, in 1575, and became so eminent for his acquaintance with cosmography, that he was appointed public lecturer on that science. About 1584 he went to Paris as chaplain to the English ambassador, and stayed there five years. After his return home he prepared for the press his collection of *The Principal Navigations, Voyages, and Discoveries of the English Nation, made by Sea, or over Land, Within the Compass of These 1500 Years*. The first volume, in folio, was published in 1589, and the third and last in 1600. Besides narratives of nearly 220 voyages, these volumes comprise patents, letters, instructions, and other documents, not readily to be found elsewhere. Hakluyt died in 1616, and was interred in Westminster Abbey.

Hakodadi (hă'kō-dă'dē), or HAKODATE, a city of Japan, near the south end of the island of Yesso, at the foot of a hill on the shore of a beautiful and spacious bay, which forms one of the best harbors in the world. The commerce is important and there are manufactures of matches, etc. The city is strikingly clean, well laid out, and attractive in other particulars. Pop. 78,040.

Hakon VII (hă'kon), Prince Charles of Denmark, was elected by the Norwegian parliament and popular vote (Nov. 12-13, 1905), as the first ruler of the resuscitated kingdom of Norway. He was born in 1872, the second son of Frederick VIII of Denmark, and in 1896 married Princess Maud, third daughter of Edward VII of England. He chose the name Hakon as a revival of the title of a number of ancient kings of Norway.

Halacha (hal'a-ka), HALAKA (Heb. 'rule'), the Jewish oral or traditional law, as distinguished from the written law laid down in the Scriptures, and like it believed to be of divine origin. It was finally reduced to a written code forming part of the *Talmud*.

Halberd, or HALBERT (hal'bert), an offensive weapon, consisting of a pole or shaft about 6 feet long, having its head armed with a steel

HALBERTS.

1, Halbert (Time of Henry VIII). 2, Do. with fleur-de-lis (Henry VII). 3, Double-axed Halbert (Charles I). 4, Halbert (Charles II). 5, Do. (William III).

point edged on both sides. Near the head was a cross piece of steel somewhat in the form of an axe, with a spike or hook at the back. It was much used in the English army in the sixteenth century, and gave its name to troops called *halber-*

diers, to whom was confided the defense of the colors, and other special duties. It is now used only on ceremonial occasions.

Halberstadt (hăl-bĕr-stät'), a town of Prussia, in the province of Saxony, 32 miles S. W. of Magdeburg, on the right bank of the Holzemme. It is an old town, with many timber-framed and curiously ornamented houses. Its principal buildings are the cathedral, the Liebfrauen church, an old Episcopal palace, town house, etc. It has considerable manufactures of carpets, soap, leather, oil, gloves, etc. Pop. 46,481.

Halcyon (hal'si-on), an old or poetical name of the kingfisher. It was fabled to lay its eggs in nests that floated on the sea, about the winter solstice, and to have the power of charming the winds and waves during the period of incubation, so that the weather was then calm; whence the term, *halcyon days*. See also *Kingfisher*.

Hale (hāl), EDWARD EVERETT, author and clergyman, born at Boston, Massachusetts, in 1822. He was graduated at Harvard in 1839, was the pastor of a Unitarian Church in Worcester, Massachusetts, 1846-56, and of one in Boston 1856-1903, when he was appointed chaplain of Congress. He died June 6, 1909. His books were numerous and a number of them highly popular. Prominent among them were *The Man Without a Country*, *Ten Times One is Ten*, *Philip Nolan's Friends*, *A New England Boyhood*, etc.

Hale, HORATIO, philologist, was born in New Hampshire, about 1817, a son of S. J. Hale. Graduating at Harvard in 1837, he studied philology and produced a valuable work entitled *Ethnology and Philology*, that contained a remarkable amount of information on those subjects. He also edited the *Iroquois Book of Rites*. He died in 1896.

Hale, JOHN P., statesman and Free-soil candidate for the Presidency, was born at Rochester, New Hampshire, in 1806. Elected to Congress in 1842, he became prominent in his opposition to slavery. In 1846 Mr. Hale was chosen U. S. Senator. In 1847 he was nominated for the Presidency by the National Liberty party, and in 1852 by the Free-soil party. His speeches were replete with humor and pathos. His 16 years in the Senate were devoted to the agitation of the slavery question. He died in 1873.

Hale, NATHAN, an American patriot, was born at Coventry, Connecticut, in 1755. He was graduated at Yale College in 1773, entered Washington's army in 1775, and took part in the battle of Long Island in 1776. Being sent by Washington to penetrate the enemy's line and obtain information, he was taken, condemned as a spy, and executed the next day, September, 1776. He has since been looked upon as a martyr to the cause of liberty. He said, 'I only regret that I have but one life to lose for my country.'

Hale, SARAH JOSEPHA, authoress, was born at Newport, New Hampshire, in 1793; died in 1879. She published *The Genius of Oblivion, and other Poems* in 1823, and *Northwood*, a novel, in 1827. She edited the *Ladies Magazine*, Boston, 1828-37, and published other poems and works of fiction.

Hales (hālz), ALEXANDER DE, surnamed the *Irrefragable Doctor;* an English theologian, born at Hales in Gloucestershire, date unknown, celebrated among the controversialists of the thirteenth century. He died at Paris in 1245.

Halévy (ä-lā-vē), JACQUES FRANÇOIS FROMENTAL ELIE, a French musical composer, born of Jewish parentage at Paris, 1799. He studied at the conservatory under Lambert and Cherubini, and was sent to Italy to finish his musical education. Here he wrote his first two operas *Les Bohémiennes* and *Pygmalion*. The first of his pieces performed was a little comic opera, *L'Artisan*, given at the Théâtre Feydau in Paris, in 1827. His chef d'œuvre, *La Juive*, appeared in 1835, and rapidly obtained a European celebrity. Among his other works are *L'Eclaire, Guido et Ginevra*, *La Reine de Chypre*, *Le Val d'Andorre*, and *La Fée aux Roses*. He died at Nice in 1862. He was a cultivated and scholarly composer but without much genius.—His son, LUDOVIC HALÉVY, born in 1834, was a popular author of vaudevilles, and wrote the librettos of most of Offenbach's operas. He also wrote the charming *L'Abbé Constantin* and other novels, and a number of plays, including *Frou Frou* and *Tricoche et Cacalot*, a comedy which had a remarkable success. He died in 1908.

Half-moon, in fortification, an outwork composed of two faces forming a salient angle, whose gorge is in the form of a crescent or half-moon.

Half-pay, in the British army, is granted as a remuneration for past services, either to an officer who retires altogether from active duty after the full period of service, or to one who is compelled by ill-health, reduction of his regiment, or some exceptional cause, to quit active service for a time.

An officer placed on the retired list in the United States army is granted 75 per cent. of the pay of his rank.

Half-pike, a defensive weapon, formerly used in the navy to repel the assault of boarders.

Half-tone, an illustration printed from a plate produced by the half-tone process. By this process blocks that may be used in an ordinary press are made from photographs. The illustrations show not only black and white, but all the gradations between these —the 'half' and other fractional 'tones,' once thought to be beyond the power of ordinary printing.

Halibut (*Hippoglossus vulgaris*).

Haliaëtus (hal-i-ā'tus), the genus of birds to which belong the white-tailed sea eagle of Britain, and the whiteheaded or bald eagle of America.

Haliburton (hal'i-bur-tun), THOMAS CHANDLER, an Anglo-American humorous writer, born at Windsor, Nova Scotia, in 1797; died in 1865. He practiced law in Halifax, wrote a *Historical and Statistical Account of Nova Scotia*, and contributed a series of humorous letters to a Halifax newspaper under the pseudonym of 'Sam Slick.' In 1840 he became judge of the Supreme Court of Nova Scotia, but subsequently went to England. In 1859 he was elected a member of Parliament.

Halibut (hal'i-but), or HOLIBUT, the *Hippoglossus vulgaris*, one of the largest of the Pleuronectidæ or flat-fish family, sometimes weighing more than 300 lbs. The fish has a compressed body, one side resembling the back and another the belly, and both eyes on the same side of the head. It is caught on both sides of the Atlantic, and is much prized for the table.

Halicarnassus (hal-i-kar-nas'us), in ancient geography, the capital of Caria, in Asia Minor, once an important city. Queen Artemisia erected here, in honor of her husband, King Mausōlus, the celebrated tomb hence known as the *Mausoleum*. Halicarnassus was the native place of Herodotus.

Halichondria (hal-i-kon'dri-a), an order of sponges comprising the common sponges of the British coasts. They are found incrusting stones and sea-weed below the tide-mark, and have often elegant forms, but are unfit for any use. One species, *H. oculata*, is popularly known as the 'mermaid's glove.'

Halicore (ha-lik'o-rē). See *Dugong*.

Halifax (hal'i-faks), a city of England, in the county of York (West Riding), on the Hebble, 36 miles W. S. W. of York. It is built on a rising slope, and has a very picturesque appearance. The more modern streets are spacious and well paved. Among the principal buildings are the parish church of St. John the Baptist (restored 1879), All Souls' Church, the Square Church, the town-hall, market-hall, theater, assembly rooms, infirmary, etc. There are several charitable institutions, three public parks, and two grammar-schools. Halifax commands abundant supplies of coal and water, and an extensive inland navigation connecting it with Hull and Liverpool. It is one of the centers of the woolen and worsted manufactures in Yorkshire, a great variety of goods being

produced. There are also iron, chemical, and machine-making works. Pop. (1911) 101,556.

Halifax, a city, capital of Nova Scotia, is situated on the slope of a commanding hill, on the western side of Halifax harbor. The harbor is one of the best and most spacious in America and is easy of access at all seasons of the year. Its length from north to south is about 16 miles, and it terminates in a beautiful sheet of water called Bedford Basin, within which are 10 square miles of good anchorage. The harbor is well fortified, and has an extensive government dockyard. The city, which was first settled as a colony by Governor Cornwallis in 1749, has spacious and regular streets, an elegant Province building, large Roman and Anglican Catholic cathedrals, a military hospital, theater, university, etc. It is the principal naval station of British America, has an extensive foreign and coasting trade, and large exports. There are numerous manufactures, including iron castings, cars, machinery paint, soap, cordage, fertilizers, skates, tobacco, paper, etc.; also rolling mills. Pop. (1911) 46,619. This city was the scene of a frightful accident on December 6, 1917, when a French vessel, loaded with munitions, including a large quantity of high explosives, was run into by a vessel laden with supplies for the Belgian Relief Commission. The munition ship was set on fire and quickly exploded with terrific violence, the whole city being shaken and the section of its known as Richmond, a district of over two square miles in area, almost completely wrecked by the explosion and the widespread conflagration that followed. This, the northern part of the city, consisted largely of frame buildings, but the more substantial buildings farther away suffered considerable damage from the violent shock. The loss in human life was great, more than 1500 persons being killed, while about 4000 were injured. The property loss was estimated at $50,000,000.

Halifax, Charles Montague, Earl of, an English poet and statesman, born in 1661; died in 1715. He was educated at Westminster School and Trinity College, Cambridge. He first attracted notice by his verses, and in 1687 wrote, in conjunction with Matthew Prior, *The Town and Country Mouse*. He entered the House of Commons as member for Malden during the Convention Parliament, became a lord of the treasury in 1692, and chancellor of the exchequer in 1694. His administration was distinguished by the adoption of the funded debt system, and by the establishment of the Bank of England. In 1700 he was raised to the peerage as Baron Halifax, was twice impeached by the House of Commons, and remained out of office during the reign of Anne. Having taken an active part in securing the succession of the house of Brunswick, George I created him an earl, and bestowed on him the order of the Garter. He became first lord of the treasury in 1714. His character was a mixture of meanness and arrogance, but his taste in literature and the arts was good, and he had a great talent for finance.

Halifax, George Saville, Marquis of, son of Sir William Saville, English statesman and writer, born in 1630; died in 1695. Having exerted himself for the return of Charles II he was created Viscount Halifax in 1667, in 1669 Earl, and in 1682 Marquis of Halifax, being also keeper of the privy seal and president of the council. He supported James II, but lost his favor by opposing the repeal of the Test and Habeas Corpus acts. He was chosen speaker of the House of Lords in the Convention Parliament, and largely contributed to the elevation of William III to the throne. He wrote *Advice to a Daughter*, various political tracts, such as the *Character of a Trimmer*, *Maxims of State*, etc. He himself was a specimen of the trimmer, his conduct, however, being guided more by patriotic than personal reasons.

Haliotis (hal-i-ō'tis), a genus of gasteropodous molluscs, both fossil and recent, commonly called *ear-shells*, or *sea-ears*, found adhering to rocks on the shore and remarkable for the pearly iridescence of the inner surface. The name is derived from their likeness to an ear.

Hall (häl), an ancient town of Austria, in the Tyrol, 6 miles east of Innsbruck, on the Inn, which is here navigable. It has very extensive salt works, and in recent times has become a summer resort. Pop. 6191.

Hall, a town of Würtemberg. See *Schwäbisch-Hall*.

Hall (hal), Asaph, astronomer, born at Goshen, Connecticut, in 1829; died in 1907. He graduated at the University of Michigan, and in 1863 was made professor of mathematics in the United States navy. In 1877 he made the capital discovery of two moons of Mars, named by him Deimos and Phobos.

Hall (hal), Basil, a naval officer and traveler, son of Sir James Hall of Douglass, born at Edinburgh in 1788, entered the navy in 1802, and became post-captain in 1817. Amongst his prin-

cipal works are: *A Voyage of Discovery to the West Coast of Corea and the Great Loo Choo Island* (1817); *Extracts from a Journal* (written on the Pacific coast of America); *Travels in North America* (1829); *Fragments of Voyages and Travels; Schloss Heinfeld, or A Winter in Styria.* He died in Gosport in 1844.

Hall, CHARLES FRANCIS, an Arctic explorer, born at Rochester, New Hampshire, in 1821. He began life as a blacksmith, became a journalist in Cincinnati; in 1860 organized an Arctic expedition in search of Sir John Franklin and remained among the Eskimos two years. In 1864 he undertook a second expedition to the same regions, where he remained till 1869. In 1871, at the instigation of Hall, the United States government fitted out the *Polaris* for an expedition to the North Pole, and placed Captain Hall in command. The *Polaris* sailed from New York, June 29, 1871, and on August 30, reached lat. 82° 16′ N., and then turned back to winter in a sheltered bay, lat. 81° 38′, where Hall died on November 8th. An account of his first expedition was given by Capt. Hall in his *Arctic Researches.*

Hall, EDWARD, an English chronicler, born in London about 1495; died in 1547. He practiced law and attained the office of judge in the sheriff's court. He had a seat in the House of Commons, and was a zealous Catholic. *Hall's Chronicle*, published in 1548, is a curious picture of the manners and customs of the age.

Hall, G. STANLEY, an American educator, bo. at Ashfield, Massachusetts, in 1845. He was educated at Williams College and in Germany. In 1888 he was chosen president of Clark University at Worcester, Massachusetts. He is especially noted for his work on the psychology of the adolescent. His books include *Aspects of German Culture* (1881); *The Contents of a Child's Mind on Entering School* (1894), and *Adolescence* (1905).

Hall, JAMES, author, was born at Philadelphia, in 1793; died in 1868. He studied law, practiced, and became a judge. His works include *Legends of the West, Tales of the Border, The Wilderness and the War-path*, etc., and with T. L. McKinney *The History of the Indian Tribes of North America.*

Hall, JAMES, geologist, was born at Hingham, Massachusetts, in 1811; died in 1898. He was appointed on the New York geological staff in 1837, and began a survey of the west of the state. His researches won him distinction, their results being described in *The Palæontology of New York.* He was made state geologist of Iowa in 1855, of Wisconsin in 1858, and of New York in 1866.

Hall, JOSEPH, an English prelate and writer, born in 1574. He was educated at Emmanuel College, Cambridge, became successively dean of Worcester, bishop of Exeter (1627), and bishop of Norwich (1641). He agreed with the Puritans in doctrine, but disapproved of their views of church government, and took a prominent part in defending the liturgy of the church against the views published by the Nonconformists in the tract *Smectymnuus.* In 1642 he was sent to the Tower along with twelve other prelates who had protested against their expulsion from the House of Peers. In 1643, when the destruction of the Establishment was finally resolved on by the Puritans, he was specially named in the ordinance passed for sequestering what were called notorious delinquents, and heartlessly robbed of all his property by inquisitors, who turned him houseless into the streets. Ultimately he was allowed to take possession of a small estate which he possessed at Higham, in the vicinity of Norwich. Here he spent the remainder of his days unostentatiously, performing the duties of a faithful pastor, and died at the advanced age of eighty-two, in 1656. Amongst his writings are: *Virgidemiarum*, a series of poetical satires written in his earlier years; *A Century of Meditations; Contemplations;* etc.

Hall, MARSHALL, an English physician and physiologist, born in 1790; died in 1857. He studied at Edinburgh and on the European continent, commenced practice at Nottingham in 1815, and removed to London in 1826, where he obtained a large practice. Dr. Hall was distinguished by his medical writings on diagnosis, the circulation of the blood, and female diseases; but particularly by his discoveries made public in his work on the nervous system, and by his method of restoring asphyxiated persons.

Hall, NEWMAN, an English minister, was born in 1816; died in 1902. He preached in the Congregational Church of Hull, 1842-54, was an advocate of the cause of the North during the American Civil war, and came to America in 1867, where he preached before both houses of Congress. On his return to London he was instrumental in the erection there of a monument to Abraham Lincoln. His *Come to Jesus* had a large circulation, and he wrote

also, *Italy, the Land of the Forum and the Vatican*, and other works.

Hall, ROBERT, a celebrated divine among the Dissenters in England, was born at Arnsby, Leicestershire, in 1764, the son of a Baptist minister. He studied at the Baptist College at Bristol, and afterwards at Aberdeen. In 1783 he became assistant pastor of Broadmead Church in Bristol, suffered for a time from mental alienation, recovered and became pastor of the Baptist Church at Cambridge, where he soon acquired a great reputation by his preaching and his writings, such as *Apology for the Freedom of the Press* (1793); *Modern Infidelity* (1800); and *Reflections on War* (1802). He again became insane and resigned his charge, but recovering, married and settled at Leicester in 1808, till in 1826 he was again called to Bristol. Nearly all his life he suffered so intensely from calculus in the kidney that for twenty years he was never able to pass an entire night in bed, and could obtain rest only by a ruinous use of laudanum. He died in 1831.

Hall, SAMUEL CARTER, an English writer, born in 1801; died in 1889. He studied law and became a barrister; reported parliamentary debates for the *New Times;* edited in succession the *Amulet*, the *New Monthly Magazine*, and the *Art Journal* (1839-80), besides various popular annuals, and the *Book of Gems*, *Book of British Ballads*, and *Baronial Halls*.

Hall, THOMAS CUMMING, theologian, was born in Armagh, Ireland, in 1858. He graduated at Princeton and studied at Berlin and Göttingen, and in 1898 became professor of theology in the Union Theological Seminary. Author of *The Power of an Endless Life*, *The Social Significance of the Evangelical Revival in England*, *The Synoptic Gospels*, *John Hall, Pastor and Preacher*, and contributions to the religious press of the country.

Hall of Fame of Great Americans. The institution thus named consists of a semicircular edifice on the ground of the University of New York, in New York City. It has a museum of seven rooms on the ground floor and a colonnade, 400 feet long, above. The building was erected in 1900 by aid of a gift of $100,000 from Helen Gould. There are 150 bronze tablets in panels to receive inscriptions of eminent citizens dead over ten years, 50 to be chosen in 1900 and 5 each succeeding five years; 50 votes from the selecting committee of 100 being needed to accept any name. At present only 51 names have been chosen, 29 in 1900, 11 in 1905, and 11 in 1910. The names chosen in 1900 were as follows: Washington, Lincoln, Webster, Franklin, Grant, Marshall, Jefferson, Emerson, Fulton, Longfellow, Irving, Edwards, Morse, Farragut, Clay, Peabody, Hawthorne, Peter Cooper, Whitney, R. E. Lee, Horace Mann, Audubon, Kent, Beecher, Story, John Adams, W. E. Channing, Gilbert Stuart, and Asa Gray. In 1905, J. Q. Adams, Madison, Lowell, Whittier, and Sherman; of foreign-born Americans, Hamilton, Agassiz, and Paul Jones, and of eminent women, Mary Lynn, Emily C. Johnson, and Maria Mitchell were elected. In 1910 the chosen names were Poe, Holmes, Bryant, Bancroft, Motley, H. B. Stowe, J. F. Cooper, Roger Williams, Phillips Brooks, Frances E. Willard, and Andrew Jackson.

Hallam (hal'am), HENRY, an English historian, son of the dean of Bristol, born at Windsor in 1777. He was educated at Eton and Oxford, and studied for the law, but abandoned it for literary pursuits. His contributions to the *Edinburgh Review* brought him into notice, and his *View of the State of Europe during the Middle Ages*, which appeared in 1818, at once established his reputation. His next work, the *Constitutional History of England*, published in 1827, showed like the first the solid learning, patient research, accuracy and impartiality of statement, which are the characteristics of Mr. Hallam's work. In 1837-39 appeared his last great work, the *Introduction to the Literature of Europe*, a useful survey of literary history, though wanting in the fineness of judgment necessary for such a work. He died in 1859. His eldest son, ARTHUR HENRY, a youth of high promise, suddenly cut off at the age of twenty-two, is the subject of Tennyson's poem, *In Memoriam*.

Halle (hal'lé), usually called HALLE AN DER SAALE (Halle on the Saale), to distinguish it from other places of the same name, an important German town in the Prussian province of Saxony, about 20 miles northwest of Leipsig, on the river Saale. The older streets are narrow and crooked, but the appearance of the town has of late been much improved. Among the principal buildings are the Church of the Virgin and that of St. Maurice, the 'Red Tower' (a clock-tower) in the market-place, the mediæval town-house, the ruined Moritzburg, originally the citadel, the university buildings, the Protestant cathedral, the theater, and

Francke's Institution, founded by Pastor Francke in 1698, comprising an orphan asylum, school, etc. The university, with which that of Wittenberg was incorporated in 1817, is a celebrated institution founded in 1694, and attended by 1500 students. Halle has extensive trade and manufactures, chiefly chemicals, oil, malt, dyes, agricultural machines, etc., besides its celebrated salt-works. Halle is mentioned as early as 806. It was long a powerful member of the Hanseatic League. Pop. (1910) 180,843.

Halleck (hal'ek), FITZ GREENE, poet, born at Guilford, Connecticut, in 1790. He became a clerk in a New York banking-house, and for years was in the employment of John Jacob Astor. In 1819 poems by him and a friend (J. R. Drake) appeared in the *New York Evening Post* under the signature of *Croaker & Co.*, and attracted some attention. In 1820 he published *Fanny*, his longest poem, a satire on the follies and fashions of the day. In 1822 he visited Europe. Amongst his best poems are *Marco Bozzaris*, *To the Memory of Burns*, *Alnwick Castle*, and *Red Jacket*. He died in 1867.

Halleck, HENRY WAGER, an American general, born at Utica, near New York, in 1815; was educated for the army at West Point, and entered the engineers in 1839. In 1846 he published *Elements of Military Art and Science*, and he was raised to the rank of captain for his services in the Mexican war. In 1854 he left the army and settled in San Francisco as a lawyer and director of a mining company. On the outbreak of the Civil war in 1861 he was created major-general in the United States army. He commanded at the siege and capture of Corinth in 1862, and soon after was made commander-in-chief of the Union armies, directing their movements from Washington, till superseded by General Grant in 1864, when he was appointed chief of staff. Ultimately he received the command of the South Division at Louisville, where he died in 1872. Amongst his writings are two works on *International Law*.

Halleluia (hal-e-lö'ya), or HALLELUJAH, or ALLELUIA ('praise ye the Lord'), a Hebrew formula of praise often occurring in the Psalms, and which is retained in the translations of the various Christian churches, probably on account of its full and fine sound, so proper for public religious services. The *Great Hallelujo* is the name given by the Jews to Psalms cxiii-cxviii, which are sung on the feasts of the Passover and Tabernacles.

Haller (hal'ér), ALBRECHT VON, a Swiss physician and physiologist, born in Bern in 1708; studied medicine at Tübingen, and afterwards at Leyden under the famous Boerhaave. He became a public lecturer on anatomy at Bern, and afterwards physician to the hospital and principal librarian. In 1736 he was made professor of anatomy and surgery in the University of Göttingen. In 1747 his *Primæ Lineæ Physiologiæ* appeared, and in 1757 his *Elementa Physiologiæ Corporis Humani*. Other works appeared later, and he was ennobled by the Emperor Francis I, and became chief magistrate of Bern, to which he had retired in 1753. Haller had a considerable reputation as a poet. He also wrote three philosophical romances, *Usong*, *Alfred the Great*, and *Fabius and Cato*. He died in 1777.

Halley (hal'li), EDMUND, an English mathematician and astronomer, born in 1656. He was educated at Queen's College, Oxford, published before he was nineteen a method for finding the aphelia and eccentricity of the planets, and stayed two years in St. Helena (1676-78) cataloging the stars of the Southern Hemisphere and arranging them into constellations. In 1682 he discovered the comet which bears his name, and his prediction of its return in 1759 was the first of its kind that proved correct. He surveyed the coast of Dalmatia at the request of the German Emperor, and returning to England, was elected Savilian professor of geometry at Oxford (1703). In 1713 he was made secretary of the Royal Society, and astronomer-royal in 1719. He died in 1742.

Halley's Comet, discovered in 1682 by Edmund Halley. (See preceding article.) Halley's demonstration that this comet was the same with the comet of 1456, 1531, and 1607 first fixed the identity of comets. It performs its revolution in about 75 years. Its last appearance was in 1910, when it failed to show the brilliance displayed on earlier occasions.

Halliwell-Phillipps, JAMES ORCHARD, originally J. O. HALLIWELL, Shakesperean scholar, was born in 1820; died in 1889. In 1839 he began his editorial labors with a reprint of *Mandeville's Travels*. He was a leading and active member of the Percy and Shakespere societies; for the former he edited the *Minor Poems* of Lydgate, *Early Naval Ballads of England*, *Nursery Rhymes of England*, etc.; and for the latter, *The Coventry Mysteries*, *Tarleton's Jests*, *The Fairy Mythology of Shakespere*, etc. His

chief Shakesperean publications are a *Life of Shakespere* (1848), the *Works of Shakespere* in 16 folio volumes, only 150 copies printed; *Calendar of the Records of Stratford-on-Avon; History of New Place;* and *Outlines of the Life of Shakespere*. He issued also 47 volumes of lithographed facsimiles of the quarto plays, and a great number of pamphlets on Shakespere, Stratford, and kindred topics. He also published a valuable *Dictionary of Archaic and Provincial Words*.

Hall-mark, the official stamp affixed by the Goldsmiths' Company of London and certain assay offices to articles of gold and silver as a mark of their fineness. The hall-mark generally denotes the place of manufacture or assay, as an anchor for Birmingham; a leopard's head for London; tree, salmon, and ring for Glasgow; a crown for Sheffield. The *standard-mark* for gold is a lion passant for England; for Edinburgh, a thistle; for Glasgow, a lion rampant; for Ireland, a harp crowned.

Hallow-even, or HALLOWE'EN (hal'ō-ēn), the evening of the 31st of October, so called as being the eve or vigil of All Hallows, or All Saints, which falls on the 1st of November. It is associated in the popular imagination with the prevalence of supernatural influences, and in Scotland is frequently celebrated by meetings of young people, with the performance of various mystical ceremonies humorously described by Burns in his poem *Hallowe'en*. The celebration of it in various ways has spread widely and is very common in the United States.

Hallucinations (hal-u-si-nā'shunz), according to Esquirol, are morbid conditions of mind in which the patient is conscious of a perception without any impression having been made on the external organs of sense. Hallucinations are to be distinguished from delusions, for in these there are real sensations, though they are erroneously interpreted. Pinel was the first who connected hallucinations with a disturbance of the phenomena of sensation, and the investigation has been pursued further by Esquirol, Maury, Brière, de Boismont, and others. All the senses are not equally subject to hallucinations: the most frequent are those of hearing; next, according to many, come those of sight, smell, touch, and taste; and hallucinations of several senses may exist simultaneously in the same individual, and also be complicated with certain delusions. The simplest form of hallucinations of hearing is the tingling of the ears; but the striking of clocks, the sounds of musical instruments and of the human voice are often heard, and in these instances, as in those of the perturbations of the other senses, there must be a diseased sensorium, though there should be no structural derangement of the nerves. Hallucinations are not confined to those whose mental faculties have been alienated, but occasionally assail and torment even the sane. Occasionally hallucinations supervene where the system is healthy, and the individual fully conscious of the unreality of the objects that address his senses, and this disorder is often associated with much ability and wisdom in the conduct of life. Amongst well-known and authenticated hallucinations are that of the second Earl Grey, who was haunted by a gory head, which, however, he could dismiss at will, and that of Bernadotte, king of Sweden, who was beset in his rides by a woman in a red cloak, although perfectly conscious of the hallucination under which he labored.

Halluin (al-ū-an), a town of France, dep. of Nord, on the right bank of the Lys, 10 miles N. N. E. of Lille. It has considerable manufactures of cloths, linen, and calicoes, besides cotton and oil mills, etc. Pop. 16,599.

Hallux (hal'luks), the innermost of the five digits which normally compose the hind foot of a vertebrate animal; in a person the great toe, in a bird the hind toe.

Halmstadt (hälm'stät), a seaport of Sweden, on the Cattegat, at the mouth of the Nissa. It has cloth-making, brewing, salmon fisheries, and a trade in deals, lumber, pitch. Pop. 15,362.

Halo (hā'lō), the name given to colored circles of light sometimes seen round the sun or moon, and to other connected luminous appearances. These phenomena are classified as: (1) *halos proper*, consisting of complicated arrangements of arcs and circles of light surrounding the sun or moon, accompanied by others tangent to or intersecting them; (2) *coronas*, simple rings, generally somewhat colored; (3) *aureolas*, the name given to the kind of halo surrounding a shadow projected upon a cloud or fog-bank, or to the colored rings observed by aeronauts on the upper surface of clouds. All these appearances are the result of certain modifications which light undergoes by reflection, refraction, dispersion, diffraction, and interference when it falls upon the crystals of ice, the raindrops, or the minute particles that constitute clouds.

Halpine (hal'pīn), CHARLES GRAHAM, poet and humorist, born in Ireland in 1829, came to the United States and adopted the profession of journalism. He served in the Civil war, and was brevetted brigadier-general at its close. Under the pen-name of Miles O'Reilly he wrote *Poems, Miles O'Reilly Papers*, etc. He died in 1868.

Hals (hāls), FRANS, the elder, a portrait and genre painter, born probably at Antwerp, Belgium, about 1580; died in 1666. Hals is usually regarded as the founder of the Dutch school of genre-painting. His subjects of feasting and carousal are treated with marvelous vivacity and spirit, and as a portrayer of faces convulsed with laughter he is without a rival. Of his portrait groups eight noble examples are preserved in the museum of Haarlem, the finest being that dated 1633, representing the officers of the corps of St. Adrian. *The Mandoline Player* (1630), in the gallery of Amsterdam, *The Laughing Cavalier*, and *Hille Bobbe* (National Gallery, Berlin), are typical examples of his single figures.

Halstead (hal'sted), MURAT, journalist, was born in Butler County, Ohio, in 1829; died in 1908. As proprietor of the *Cincinnati Commercial*, and later of the *Commercial Gazette*, he became an important figure in the annals of the Republican party.

Ham, one of the three sons of Noah. He had four sons—Cush, Mizraim, Phut, and Canaan—from the first three of whom the tribes that peopled the African continent are stated to have sprung, while Canaan became the father of the tribes that principally occupied the territory of Phœnicia and Palestine. See *Hamites*.

Ham, the inner angle of the joint which unites the thigh and the leg of an animal, but more generally understood to mean the cured and smoked thigh of the hog. Usually the meat is first well rubbed with salt, and a few days after it is rubbed again with a mixture of salt, saltpeter, and sugar, though sometimes the saltpeter is omitted. After lying for eight or ten days it is ready for drying. The smoking of hams consists in subjecting them to the smoke of a fire, wood being used in preference to coal.

Hamadan (hăm-ä-dăn'), a city of Persia, on the site of the ancient Ecbatana, in the province of Irak-Ajemi, 185 miles southwest of Teheran. It is pleasantly situated near the base of a great range of mountains, and is surrounded by ruins as well as by beautiful orchards and gardens. It has extensive caravanseries and bazaars, a number of tanneries, and also considerable manufactures of carpets, woolens, and cotton stuffs. Pop. estimated at 40,000.

Hamadryad (ham'a-drī-ad), in Greek mythology, a kind of wood-nymph conceived to inhabit each a particular tree, with which they were born and with which they perished.

Hamadryas. See *Baboon*.

Hamah (hä'ma), or HAMATH, a city of Syria, on the banks of the Orontes or El-Azy, on the caravan route between Aleppo and Damascus, in a well-watered and productive district. Amongst the curiosities are huge Persian water-wheels, 70 or 80 feet in diameter, which are turned by the current of the river and supply the houses and gardens with water. The famous *Hamath Inscriptions* were noticed by Burckhardt in 1812, but only recently examined and published. They are cut in relief on four stones of black basalt. The characters are entirely different from any others known, and no key to their decipherment has yet been discovered.

Hamamelidaceæ (ham-a-mel-i-dā'-se-ē), the witch-hazels, a small natural order of epigynous exogenous trees or shrubs, varying in height from 6 to 30 feet. *Hamamelis Virginica* yields the drug witch hazel.

Hambato. See *Ambato*.

Hamburg (ham'burg), a maritime city in Germany, formerly free, now a portion of the empire, and the greatest commercial port on the continent of Europe, is situated about 80 miles from the North Sea, on the north branch of the Elbe, which is navigable for large vessels. The town of Altona adjoins it on the west. From the Elbe proceed canals which intersect the eastern and lower part of the city in all directions, and it is also intersected by the Alster, which here forms two fine streets, the Binnenalster and Aussenalster. The quays and harbor accommodations are very extensive. After the destructive fire of 1842 whole streets were rebuilt in a magnificent and expensive style. Hamburg is not, however, very rich in notable buildings. Amongst the most important are the church of St. Nicholas, a noble Gothic structure with a lofty tower and spire, built between 1845 and 1874; St. Peter's, another lofty Gothic edifice; St. Michael's, the largest of the churches; St. Catherine's, an ancient edifice; St. James's, erected in 1354, but surmounted by a modern tower;

an elegant Jewish temple; an exchange, a noble edifice, consisting chiefly of a magnificent hall, surrounded by a fine colonnade. There are also the Johanneum institution, containing an ancient college, museums, and the city library, with about 300,000 volumes; several well-endowed hospitals; zoological and botanic gardens; the Kunsthalle, a large collection of pictures and sculpture; theaters, etc. Hamburg is of most importance on account of its great shipping trade and the business of banking, exchange, marine assurance, etc., carried on in connection with that. Its manufactures, though large, are less important, including shipbuilding, tobacco and cigar making, iron-founding, brewing, etc. A great many emigrants embark here. Pop. 958,079. The state of Hamburg embraces a territory of 158 square miles, and consists of three divisions, viz.:—City of Hamburg, fifteen rural districts, and outlying towns and bailiwicks (Cuxhaven, Ritzebüttel, etc.). The legislative power belongs in common to the senate and the house of burgesses, but the executive power is vested chiefly in the senate, which is composed of eighteen members, of whom nine must have studied law or finance, and of the other nine seven must belong to the commercial class. The members are elected for life. The house of burgesses consists of 160 members, half of whom are elected every three years by the votes of all tax-paying citizens, while the other half are chosen partly by a much-restricted franchise, and partly deputed by guilds and corporations. The city owes its foundation to the emperor Charlemagne, who (808-811) built a citadel and a church on the heights between the Elbe and the eastern bank of the Alster, as a bulwark against the neighboring pagans. It became important as a commercial city in the twelfth century, and in the thirteenth it combined with Lübeck in forming the Hanseatic League. In 1618 Hamburg was formally acknowledged a free city of the empire. During the Thirty Years' war its population and prosperity continued to increase on account of the immunity of its position, and in the following century it obtained a large share of the trade with North America. In 1810 it was formally incorporated in the French empire with the northwestern part of Germany; in 1815 it joined the Germanic Confederation as a free city; in 1888 it was included in the Zollverein.

Hamden, a town (township) of New Haven County, Conecticut, 6 miles N. of New Haven. Iron castings, suspender webbing, radiators, corsets and garden implements are produced. Pop. 7000.

Hameln (hā'meln), a town of Germany, in Hanover, on the Weser, which is here crossed by a suspension bridge. It has many picturesque old buildings and remains. Pop. 18,965.

Hamerton (ha'mer-tun), PHILIP GILBERT, an English art critic, born at Laneside, in Lancashire, in 1834; studied landscape painting, but deviated into literature, publishing a work on *Heraldry* in 1851, and in 1855 *The Isles of Loch Awe and other Poems*. In 1859 Mr. Hamerton married a French lady, and afterwards resided chiefly at Autun. He made himself well known to the English public as a writer on art. Amongst his works are *Thoughts about Art* (1862), *Contemporary French Painters* (1867), *The Intellectual Life* (1873), *French and English* (1889), and several novels. He died in 1894.

Hamilcar (ham-il'kär), the name of several Carthaginian generals, of whom the most celebrated was Hamilcar, surnamed Barca (the lightning), the father of the great Hannibal. While quite a young man he was appointed to the command of the Carthaginian forces in Sicily, in the eighteenth year of the first Punic war, B.C. 247, when the Romans were masters of almost the whole island. For two years he defied all the efforts of the Romans to dislodge him; but the Carthaginian admiral, Hanno, having been totally defeated off the Ægates, B.C. 241, he reluctantly consented to evacuate Sicily. A revolt of the returned troops, joined by the native Africans, was successfully repressed by Hamilcar. He then entered on a series of campaigns in Spain, where he founded a new empire for Carthage. Here he passed nine years, and had brought the whole southern and eastern part of the country under Carthaginian rule when he was slain in battle against the Vettones, B.C. 229. His great design of making Spain a point of attack against Rome was ably carried out by his son Hannibal.

Hamilton (ham'il-tun), a city of Scotland, in Lanarkshire, on the Clyde, about 10 miles southeast of Glasgow. Numerous villas and gardens give it a pleasant rural aspect. Coal, ironstone, and limestone are extensively worked in the vicinity. The county buildings, town-hall, and extensive cavalry barracks are the most important public buildings. Near the town is Hamilton Palace, seat of the Duke of Hamilton, a large building, chiefly modern. In the

adjacent grounds are the ruins of Cadsow Castle and a few old oaks, the remains of Cadsow Forest. Here a herd of wild cattle are kept, white, with black ears and muzzles. Pop. (1911) 38,644.

Hamilton, the island metropolis of the western district of Victoria, Australia, on the Grange Burn Creek, counties of Dundas and Normandy, 224 miles w. of Melbourne, with which it is connected by railway. The district is pastoral and agricultural. Pop. 4026.

Hamilton, the capital of the Bermudas, on the coast of the largest island, with a landlocked harbor. Pop. 2246.

Hamilton, a city of Canada, in the province of Ontario, county of Wentworth, on the south side of Burlington Bay, Lake Ontario, an important railway center, with excellent water shipping facilities, is situated in a fertile horticultural and agricultural section. The public buildings include custom house, theaters, public schools, Collegiate Institute, Technical School, Normal School and the Provincial Asylum for the Insane. Dundurn Park (40 acres) is notable. There are numerous factories engaged in the manufacture of steel, iron, cotton and woolen goods, agricultural machinery, plows, boats, furniture, wire fencing, machinery, etc. Pop. 100,908.

Hamilton, a city, county seat of Butler County, Ohio, on the Great Miami River, 25 miles north of Cincinnati. A manufacturing city with large safe and bank vault factories, paper mill, tool and Corliss engine plants, etc. Served by four steam and two electric railways. Founded in 1791 by General Arthur St. Clair. The site of old Fort Hamilton is marked by an imposing monument in heart of city. Pop. 35,279.

Hamilton, ALEXANDER, a distinguished American officer and legislator during the contest for independence, was born in 1757 in the island of Nevis, West Indies. At the age of sixteen he became a student of Columbia College, New York. On the outbreak of the war he received (1776) a commission as captain of artillery, and soon attracted the attention of Washington, who appointed him his aide-de-camp and employed him in the most delicate and difficult affairs. In 1781 he left the service, studied, entered Congress as a member from New York in 1782, and in 1787 was one of the delegates to the Constitutional Convention. He was a strong supporter of the federal party, and by the letters which he wrote to the *Daily Advertiser*, of New York, afterwards published under the title of *The Federalist*, contributed greatly to the success of the party. It was due to his strenuous efforts that the constitution was ratified by the State of New York. On the organization of the federal government in 1789, with Washington at its head, Hamilton was appointed secretary of the treasury, and won a high reputation by his skilful treatment of the national finances. This office he held till 1795, when he resigned and retired into private life. In 1798 he was appointed second in command of the provisional army raised under the apprehension of a French invasion, and on the death of Washington, in 1799, he became commander-in-chief. In 1804 he became involved in a political dispute with Aaron Burr, then candidate for the governorship of New York, accepted a challenge from that gentleman, and received a fatal wound in the subsequent duel, July 11, 1804.

Hamilton ANDREW (1676-1741), an American lawyer, perhaps the ablest of his time and the first to achieve a continental reputation. In 1717 he became attorney-general of Pennsylvania and was in the provincial council 1721-24. He was elected from Bucks county to the provincial assembly 1727-39. He is best known for his gratuitous defense of John Peter Zenger (q. v.), of New York, who was arrested for printing seditious libels. Hamilton's defense resulted in the acquittal of Zenger and established freedom of the press in North America. He was born in Scotland, went to Virginia, and removed to Philadelphia.

Hamilton, ANDREW (?-1703), an English colonial governor in America, born in Scotland. From 1692 to 1701 he was governor of the colonies of East and West Jersey, and was appointed deputy governor of Pennsylvania by William Penn in 1701.

Hamilton, SIR IAN STANDISH MONTEITH (1853-), a British general, born at Corfu. He entered the army in 1873, served in the Afghan war (1878-80), Boer war (1881), Nile Expedition (1884-85), and in the South African war of 1899-1901, where he took part in the defense of Ladysmith. He was chief of staff to Lord Kitchener (q. v.), 1901-02. He fought in the European war (1914-18) and commanded the Mediterranean Expeditionary Forces in the heroic campaign at Gallipoli (q. v.).

Hamilton, JAMES, a marine painter, was born in Ireland about 1820, and was brought to the United States in infancy. He studied and practiced art in Philadelphia, and won distinction by his illustrations of Dr. Kane's *Arctic Explorations* and his ad-

mired *Capture of the Serapis* and *Old Ironsides*. He was especially successful in the representation of water scenes, and was unsurpassed in his delineation of oceanic effects. He died in 1878.

Hamilton, PATRICK, usually considered as the first Scottish reformer, was the second son of Sir Patrick Hamilton of Kincavel and Stanehouse, and of Catharine, daughter of the Duke of Albany, second son of James II. He was probably born in Glasgow in 1504, and was educated partly at St. Andrews and partly at Paris, where he took his degree in 1520. While still a boy he had been appointed Abbot of Fearn, in Rossshire, but never went into residence, settling instead at St. Andrews in 1523. Here he began to announce his convictions in the principles of the Reformation, and was summoned in 1526 by Archbishop Beaton to stand his trial for heresy. He fled to Germany, where his education as a reformer was completed by an intimate acquaintance with Luther and Melanchthon. After six months' absence he returned to Scotland, and began to preach the gospel openly at Linlithgow, but was allured by Beaton to St. Andrews under pretence of a friendly conference, put on his trial, convicted of various heresies, and burned at the stake, March 1, 1527, in the twenty-third year of his age. His death did perhaps more to extend the principles of the Reformation in Scotland than even his life could have done.

Hamilton, SIR WILLIAM, grandson of William, third duke of Hamilton, was born in Scotland in 1730. In 1761 he was elected member of parliament for Midhurst, and in 1764 he received the appointment of ambassador to the court of Naples. He devoted his leisure to science, making observations on Vesuvius, Ætna, and other volcanic mountains; and the results of his researches are detailed in the *Philosophical Transactions*, and in his *Campi Phlegræi, or Observations on the Volcanoes of the Two Sicilies* (Naples, 1776-79, three vols. folio). He took an active part in the excavation of Herculaneum and Pompeii, and collected a cabinet of antiquities, of which an account was published by D'Hancarville, in a splendid work with finely colored plates. Sir William's second wife was the Lady Hamilton, who became notorious from her connection with Admiral Nelson. He died in 1803.

Hamilton, SIR WILLIAM, a metaphysician, the most acute logician and most learned philosopher of the Scottish school, was born in 1788 at Glasgow, where his father and grandfather held in succession the chairs of anatomy and botany. Having studied with distinction at Glasgow, in 1809 he entered Baliol College, Oxford, as a Snell exhibitioner, where he gained first-class honors. In 1813 he was admitted to the Scottish bar, but never acquired a practice in his profession, his taste lying much more towards the study of philosophy, in which he had already made extensive researches. In 1820 he became a candidate for the chair of moral philosophy in Edinburgh, rendered vacant by the death of Thomas Brown, but being defeated by Professor John Wilson, he was obliged to content himself with the unimportant chair of universal history, forming no part of the college curriculum, to which he was appointed in 1821 by its patrons, the Faculty of Advocates. In 1829 the publication in the *Edinburgh Review* of his celebrated critique of Cousin's system of philosophy gave him at once a first place amongst the philosophical writers of the time. This was followed in 1830 by his criticism of Brown, and in 1831 by his article on the authorship of the *Epistolæ Obscurorum Virorum*. In 1836 he was appointed to the chair of logic and metaphysics in Edinburgh University. Here he gathered about him a number of ardent students, and re-established the fame of the Scottish school of metaphysicians, which had begun to wane. In 1846 he published an annotated edition of the works of Thomas Reid, and in 1854 the first volume of a similar edition of the works of Dugald Stewart. He died suddenly at Edinburgh in 1856. His lectures on logic and metaphysics were collected and edited by Dean Mansel and Professor Veitch. Hamilton's most important contributions to philosophy are connected with his doctrine of the Quantification of the Predicate in his system of logic; his theory of the 'relativity of knowledge,' in the Kantian sense, held along with an apparently incompatible doctrine of immediate perception of the non-ego; and his definition of the infinite or unconditioned as a mere negation of thought.

Hamilton, SIR WILLIAM ROWAN, mathematician and astronomer, was born in Dublin in 1805. Before he had completed his fourteenth year he had made himself acquainted with thirteen languages, among which were Arabic, Persian, Hindustani, Sanskrit, and Syriac. At the age of seventeen he was pronounced by a competent authority the first mathematician of his age. At Trinity College, Dublin, he gained the highest honors, and he was appointed in 1827 professor of astronomy in Trinity College,

as well as astronomer-royal. He was knighted in 1835, and elected in 1837 president of the Royal Irish Academy. He contributed numerous papers to the transactions of learned bodies, and made some valuable discoveries; but his fame is chiefly founded on his invention of the calculus of quaternions, a new method in the higher mathematics. Amongst his published works are *General Method in Dynamics*, *Algebra as the Science of Pure Time*, and *Memoirs on Discontinuous Functions*. He died in 1865.

Hamilton Group, an American geological formation, occupying the middle of the Devonian period, so named from Hamilton, New York, near which it is best displayed. It consists of shales, with some limestones, and follows the Appalachian system southward into Virginia, with an extension westward into and beyond Ohio. Flagstones of excellent quality are obtained from it, and some of its deeper bituminous) layers are supposed to be the chief source of the Pennsylvania and West Virginia petroleum and natural gas. The fossils include land and water plants, invertebrate animals and fishes.

Hamirpur (hum-ēr-pur'), a town of India, Northwestern Provinces, on the right bank of the Jumna. Pop. 7155.

Hamites (ham'īts; descendants of Ham), the name given to a number of races in North Africa, who are regarded as of kindred origin and speak allied tongues. They include the ancient Egyptians and their modern descendants, the Copts, the Berbers, Tuaregs, Kabyles, the Gallas, Falashas, Somali, Dankali, etc.

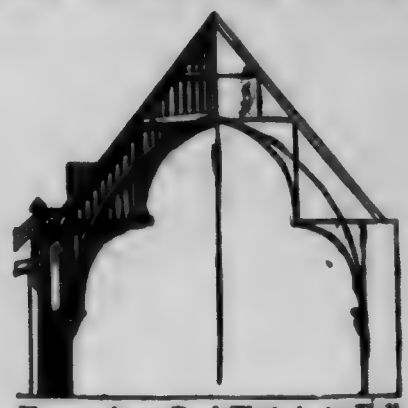
Hamlet (ham'let), Prince of Denmark, the hero of Shakespere's most famous tragedy. The story is founded on an old tradition, related, amongst others, by Saxo-Grammaticus, of a Danish prince, Hamlet, who lived about 500 B.C., but is essentially altered in details and conclusion.

Hamlin (ham'lin), Hannibal, Vice-President, was born at Paris, Maine, in 1809. He practiced law, and served as a member of the Legislature. In 1842 he was elected to Congress, and in 1848 to the Senate. In 1860 he was elected vice-president with Lincoln. He was returned to the Senate in 1869, serving until 1881, and died in 1891.

Hamm (häm), a manufacturing town of Prussia, province of Westphalia. Its industries, which are important, are mainly in metals. Pop. 43,658.

Hamme (häm), a town in the province of E. Flanders, Belgium, 18 m. N.E. of Ghent. Among its principal manufactures are rope, oil, lace, and linen. Pop. 15,000.

Hammer-beam, a short beam attached to the foot of a principal rafter in a roof, in the place of the tie-beam. Hammer-beams are used in pairs, and project from the wall, extending less than half-way across the apartments. The hammer-beam is generally supported by a rib rising up from a corbel below; and in its turn forms the support of another rib, constituting, with that springing from the opposite hammer-beam, an arch.



Hammer-beam Roof, Westminster Hall.

Hammer-cloth, a cloth sometimes used to cover the box-seat of a private carriage. It usually bears the coat of arms of the owner of the carriage.

Hammerfest (häm'ēr-fest), a maritime town in Norway, in Finmarken, on Hvalöe (Whale Island), a bare, treeless, barren spot, in lat. 70° 40' N., being the most northerly town in the world. It is a fishing center, and carries on a lively trade. Though within the Arctic circle, the winter is comparatively mild, and the surrounding waters seldom freeze. Pop. 2298.

Hammer-headed Shark. See *Shark*.

Hammer-oyster, a bivalve shellfish, *Malleus vulgaris*, inhabiting the Indian Archipelago, resembling the pearl-oyster when young, but becoming always more hammer-like as it advances in age, by the lengthening of its two ears.

Hammer-Purgstall (purg-stal'), Joseph Freiherr von, an eminent orientalist, was born in 1774 at Gratz, in Styria. He was educated at the Oriental Academy, Vienna, and when still a very young man

took a share in the preparation of Meninsky's *Arabic, Persian, and Turkish Lexicon*. In 1799 he accompanied as interpreter to Constantinople the internuncio Freiherr von Herbert, who afterwards intrusted him with a mission to Egypt, where he collected various antiquities and manuscripts for the Imperial Library. He also accompanied, as interpreter and secretary, Sir Sidney Smith and Yussuf-Pasha in the campaign against General Menou. In 1810, on the occasion of the marriage of Napoleon with Maria Louisa of Austria, he accompanied the latter to Paris, where he became intimate with Sylvestre de Sacy and other orientalists. In 1817 he was appointed imperial councillor at the court of Austria, where he also held the post of interpreter. On succeeding to the estates of the Countess of Purgstall in 1835 he received the title of *Freiherr* (Baron). He died in 1856. Among his numerous literary works may be mentioned *Constitution and Administration of the Ottoman Empire; Constantinople and the Bosporus; History of the Ottoman Empire* (ten vols.); *History of Turkish Poetry;* and *History of Arabic Literature*.

Hammersmith, a suburban district of London, in Middlesex, about 6 miles W. S. W. of the London post-office. The Thames is here crossed by a fine suspension bridge. The vicinity is occupied chiefly by nurseries and market-gardens. Pop. of parish, 121,603.

Hammerstein (ham'ĕr-stīn), Oscar, theatrical and operatic manager, born at Berlin, Germany, in 1847; came to America in 1863. He engaged in the cigar business, invented labor-saving devices in this industry, grew wealthy, and engaged in theatrical and operatic enterprises. He wrote several short comedies in German and produced them in New York. Became manager of the Stadt Theater in 1870, and subsequently built the Harlem Opera House, the Manhattan Opera House, and several theaters. He built in 1907 a magnificent opera house in Philadelphia, which he sold in 1910 and went to England, where he built a grand-opera house in London. His rivalry with the Metropolitan Opera Co. ended in his signing an agreement (1910) not to produce opera for ten years. He died August 1, 1919.

Hammock (ham'ok), a rectangular piece of cloth or netting about 6 feet long and 4 feet wide, gathered together at the two ends and slung horizontally, forming a sort of bed or place in which one may recline for pleasure. Hammocks are in common use on board ships of war. The word is said to be of Caribbean origin.

Hammond (ham'und), a city of Lake County, Indiana, 20 miles S. S. E. of Chicago. It has a large slaughter house, a distillery, and manufactures of hardware, steel springs, nails, chemicals, etc. Pop. 20,925.

Hammond, John Hays, mining engineer, was born at San Francisco in 1855. He studied mining at Freiburg, Saxony, and became an expert on the United States geological survey in 1880. He subsequently examined mining fields in all parts of the world, being consulting engineer in South Africa 1893-96. Then he joined in the reform movement, and though taking no part in the Jameson raid; yet was arrested in connection with it and sentenced to death, a sentence, afterwards commuted to fifteen years' imprisonment. He was later released on payment of a fine of $125,000. In 1911 he was appointed to represent the United States at the coronation of George V.

Hammond, William A., surgeon, born at Annapolis, Maryland, in 1828; died in 1900. He graduated at the University of New York in 1848, and entered the army as assistant surgeon. He became professor of anatomy and physiology in the University of Maryland in 1860, re-entered the army in 1861, and was appointed surgeon-general in 1862. He was professor of nervous diseases at Bellevue Hospital (1868-73) and subsequently at the University of New York. He wrote *Sleep and its Derangements*, and other works.

Hammonton, a town in Atlantic County, New Jersey, 31 miles S. E. of Philadelphia. It is in a fruit and poultry region, and produces wines, cut-glass ware, etc. Pop. 5088.

Hammurabi (hä-mō-rä-bē), a king of Babylon, identified by Schrader with Amraphel, king of Shinar (Gen. 14:1). By his victories over Elam, Larsa, Sumer and Akkad he unified the Babylonian empire. His reign is variously dated between 2400 and 2000 B. C. The discovery and translation of the Hammurabi code in 1902 threw much light on Babylonian history.

Hampden (hamp'den), John, celebrated for his patriotic opposition to taxation by prerogative, was born in London in 1594, being cousin-german by the mother's side to Oliver Cromwell. In 1609 he was entered a gentleman commoner at Magdalen College, Oxford. He began the study of law in the Inner Temple, but having inherited an ample fortune on his father's death he lived the usual life of a country gentle-

man. He entered Parliament in the beginning of Charles I's reign as member for Grampound, and continued to sit in the House of Commons three times in succession as member for Wendover, and finally as member for Bucks. Although for some years a uniform opposer of the arbitrary practices in church and state, it was not until 1636 that his resistance to Charles's demand for ship-money made him the argument of all tongues. Although the decision in the Court of Exchequer was given against him by seven voices to five, the victory, as far as regarded public opinion, was his. In the following year (1637) he was one of those who meditated emigration to America, which they were prevented from carrying out by an order in council detaining them. Henceforward he took a prominent part in the great contest between the crown and the Parliament, and was one of the five members whom the king, in 1642, so imprudently attempted, in person, to seize in the House of Commons. When the appeal was made to the sword, Hampden accepted the command of a regiment in the Parliamentary army under the Earl of Essex, and was fatally wounded on Chalgrove Field, 24th June, 1643.

Hampshire (hamp'shir), HANTS, or SOUTHAMPTONSHIRE, a maritime county, including the Isle of Wight, in the south of England; area 1640 sq. miles. Its surface is pleasantly varied with gently rising hills, fruitful valleys, and extensive woodlands. The coast-line is very irregular; the principal indentation, Southampton Water, is navigable almost to its head for vessels of considerable burden. In its confines is the New Forest, and among its streams is the Avon. Two ranges of chalk hills, the North and South Downs, traverse the county, running in direction nearly east and west. On the Downs large flocks of sheep, known as the 'Hampshire Downs' are fed. Hampshire is also famous for its wool, bacon, honey, and timber. The manufactures are unimportant, but the shipping is very extensive. Pop. 915,503.

Hampstead (hamp'sted), a suburb of London, and Parliamentary borough in Middlesex. It is situated on the declivity of a hill on the northwestern side of the city, and has long been celebrated for its fine air and the beauty of its surroundings. Hampstead Heath crowns the summit of the hill, and is now sprinkled over with handsome villas. Pop. 82,329.

Hampton (hamp'tun), a village of Middlesex, situated 14 miles S. W. of London, on the left bank of the Thames. Pop. 9221. About a mile from the village are the palace and park of Hampton Court, originally built by Cardinal Wolsey in 1525. Hampton Court has been the residence of many sovereigns, from Henry VIII, to whom it was presented by Wolsey, down to George II. It contains a valuable collection of pictures by Holbein, Lely, Kneller, West, etc.

Hampton, a city, county seat of Elizabeth City County, Va., one of the original shires of the Colony of Virginia, on the north side of Hampton Roads, 15 miles N. N. W. of Norfolk; was settled in 1610; incorporated as a town in 1887, and as a city in 1908. There are large fish and oyster industries and several crab-canning factories. The Hampton Normal and Agricultural Institute, for the education of Indian and Negro youths, and a National Soldier's Home are just outside the corporate limits. Pop. 5505.

Hampton, WADE, grandson of a Revolutionary general of the same name, was born at Columbia, South Carolina, in 1818; died in 1902. Graduating at the University of South Carolina, he became a lawyer, and on the outbreak of the Civil war joined the Confederate army. In 1862 he served as a brigadier-general at Antietam and in 1863 was wounded at Gettysburg. Promoted major-general, he was placed in command of all the cavalry of Lee's army in 1864, and served in South Carolina in 1865. He was elected governor of South Carolina in 1876 and again in 1878, was United States Senator, 1879-91, and was appointed commissioner of railroads in 1893.

Hampton Court Conference, a conference which took place in 1604 at Hampton Court under the presidency of James I between the representatives of the Episcopalian and Puritan parties in the church. A few slight alterations were made in the Common Prayer Book, and it was determined that a new version of the Bible should be undertaken. This, the Authorized Version, appeared in 1611.

Hampton Normal and Agricultural Institute, a college for colored and Indian youths of both sexes, founded in 1868, under the auspices of the American Missionary Association and under the charge of General Samuel C. Armstrong, at Hampton, Virginia. At first devoted to colored students, Indians were admitted in 1878, 15 held as prisoners of war being the first students. The Indian pupils are chiefly from the Sioux tribe. Instruction is given in farm work and in various trades to boys, and in household work, sewing, etc., to girls. The institute has a

tract of 185 acres of farm land, and a few miles away has 600 acres mainly devoted to stockraising. The students are kept under military discipline. They number about 1300 colored and 60 Indians, under 100 instructors. Among the numerous graduates the most notable has been Booker T. Washington, of Tuskegee Institute.

Hamster (ham'stèr; *Oriostus*), a genus of rodent animals belonging to the family of the Muridæ (mice). They are distinguished by their having cheek-pouches in which they convey grain, peas, etc., to their winter residence, and are common in the north of Europe and Asia.

Han, a Chinese dynasty (B.C. 206 to A.D. 220), with which commences the modern history of China.

Hanaper (han'a-pèr), formerly an office in the English Court of Chancery, so called because all writs regarding the public were once kept in a *hanaper* or hamper.

Hanau (han'ou), a town of Prussia, province Hesse-Nassau, at the confluence of the Kinzig with the Main. Pop. (1910) 37,472.

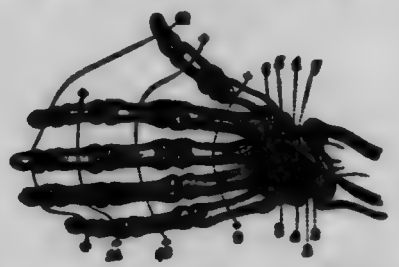
Hancock (han'kok), JOHN, a Revolutionary patriot and president of Congress, born in Quincy, Massachusetts, in 1737. In the inception of the Revolutionary struggle he was a leading spirit, and the attempt to arrest Hancock and Samuel Adams led to the battle of Lexington. Mr. Hancock was a member of the Continental Congress from 1775 to 1780, also from 1785 to 1786, serving as president of the body from 1775 to 1777. The Declaration of Independence as first published bore only his name. He served as governor of Massachusetts twelve years. As an orator he was eloquent; as a presiding officer, dignified and impartial. He died in 1793.

Hancock, WINFIELD SCOTT, soldier was born in Montogomery County, Pennsylvania, in 1824; graduated at West Point in 1844, served as lieutenant in the Mexican war, and was made captain in 1855. In 1861 he was appointed brigadier-general of volunteers, and served with distinction in the early years of the war, on the Peninsula, at Antietam, and at Fredericksburg. He commanded a corps at Gettysburg and was wounded. In 1864 he took command of the second corps of Grant's army, and at the battle of Spotsylvania captured nearly 4000 prisoners and twenty pieces of artillery. In 1864 he was made brigadier-general in the regular army and major-general in 1866, and held several commands until 1880, when he was nominated by the Democratic party as its candidate for the Presidency. He was defeated by Garfield, the Republican candidate, and died in 1886.

Hancock, a town of Houghton County, Michigan, connected with Lake Superior by a ship canal, and on the Copper Range and the Mineral Range railroads. Rich veins of pure copper are mined here, and there are extensive stamping mills, large foundries and machine shops, smelting works, etc. Pop. 8981.

Hand, the part of the body which terminates the arm, consisting of the palm and fingers, connected with the arm at the wrist; the principal organ of touch and prehension. The human hand is composed of twenty-seven bones, namely, eight bones of the carpus or wrist arranged in two rows of four each, the row next the forearm containing the scaphoid, the semilunar, the cuneiform, and the pisiform, and that next the metacarpus, the trapezium, the trapezoid, the os magnum, and the unciform. The metacarpus consists of the five bones which form the palm, the first being that of the thumb, the others that of the fingers in succession. Lastly, the fingers proper contain fourteen bones called phalanges, of which the thumb has but two, all the other digits having three each. These bones are jointed so as to admit of a variety of movements, the more peculiar being those by which the hand is flexed backwards, forwards, and sideways, and by which the thumb and fingers are moved in different ways. The chief muscles which determine these movements are the *flexors*, which pass down the forearm, are attached by tendons to the phalanges of the fingers, and serve to flex or bend the fingers; and the *extensors* for extending the fingers. There are two muscles which flex all the fingers except the thumb. The thumb has a separate long and short flexor. There is a common extensor for the fingers which passes down the back of the forearm and divides at the wrist into four tendons, one for each finger, each being attached to all three phalanges. The forefinger and little finger have, in addition, each an extensor of its own, and the thumb has both a short and a long extensor. The tendons of the muscles of the hand are interlaced and bound together by bands and aponeurotic fibers, and from this results a more or less complete unity of action. It is sometimes difficult to make a movement with a single finger without the others taking part in it, as in executing instrumental music, for instance; but practice gives to these movements perfect independence. Of all the movements of the

hand the opposition of the thumb to the other fingers, alone or united, especially characterises the human hand. This action of the thumb results from its length, from the first metacarpal bone not being placed on the same plane as the other four, as is the case in the monkey, and from the action of a muscle—the long flexor of the thumb—peculiar to the human hand. This muscle completes the action of the other motor of the thumb, and permits man to hold a pen, a graver, or a needle; it gives to his hand the dexterity necessary in the execution of the most delicate work. Properly speaking then, the hand, with its highly specialized muscles, belongs to man alone. It cannot be considered, as in the ape, as a normal organ of locomotion, though it is closely approached in structure in the highest apes. It is essentially the organ of touch and prehension. It molds itself to a body to ascertain its form; it comes to the aid of the eye in completing or rectifying its impressions. The functions of touch devolve principally upon its anterior or palmar face, the nervous papillæ abounding specially at the end of the fingers. A layer of adipose tissue, very close in texture, protects, without lessening its power or its delicacy, the network of muscles, vessels, and nerves, with which this remarkable organ is equipped.



Skeleton of Human Hand and Wrist.

1. Scaphoid bone. 2, Semilunar bone. 3, Cuneiform bone. 4, Pisiform bone. 5, Os trapesium. 6, Os trapezoides. 7, Os magnum. 8, Unciform bone. 9, Metacarpal bones of thumb and fingers. 10, First row of phalanges of thumb and fingers. 11, Second row of phalanges of fingers. 12, Third row of phalanges of thumb and fingers.

Handball, a game of ball, played without any instrument for striking, the hand only being used. The regulation handball court is from 60 to 65 feet long, and 22 to 25 feet wide. Two or four men can play, one or two on a side.

Handcuffs, an instrument formed of two iron rings connected by a short chain or fixed on a hinge on the ends of a very short iron bar, which being locked over the wrists of a malefactor, prevents his using his hands.

Händel (han'del; properly Handel), George Frederick, a great German composer, born at Halle on the Saale, in 1685. The strong passion which he early showed for the art overcame his father's opposition to training him as a musician, and at the age of seven he was placed under the tuition of Zachau, organist of Halle Cathedral, and was soon so far advanced in the practical part of the science as to be able to officiate occasionally as deputy to his instructor. In 1696 he was sent to Berlin, where he heard the music of Bononcini and Ariosti, then at the head of the Berlin Opera House. He returned to Halle, was appointed organist of the cathedral in 1702, but soon left to visit Hanover and Hamburg, where Steffani and Reinhard Keiser, the latter the greatest German operatic composer of his day, resided. At Hamburg he played second violin in the orchestra, and brought out in 1704 his first work, an oratorio on the *Passion*, and his first opera, *Almira*, followed in February by his *Nero*, and subsequently by his *Florinda and Daphne*. In 1706 he went to Italy. On his return to Germany he entered the service of the Elector of Hanover, afterwards George I of England, as musical director. He visited England twice, and ultimately, having received a pension from Queen Anne, settled down there. For some years his popularity was very great. He was placed at the head of the newly-founded Royal Academy of Music, and accumulated a large fortune

George Frederick Händel

in spite of the heavy losses which he incurred by setting up an opera company in opposition to that supported by the leading nobility and the principal Italian singers. Amongst the operas which he had composed up to this date (1735) are: *Radamisto*, *Ottone*, *Giulio Cesare*, *Flavio*, *Tamerlano*, *Scipio*, *Ricardo I*, *Orlando*, *Ariadne*, etc. His last opera was performed in 1740. By this time he had begun to devote himself chiefly to music of a serious nature, especially the oratorio. The approval which his first works of this kind (*Esther*, 1731; *Deborah*, 1732; *Athalia*, 1733) had met with encouraged him to new efforts; and he produced in succession *Israel in Egypt*, *L'Allegro* and *Il Penseroso*, *Saul*, and *The Messiah*. The last-mentioned, which is his chief work, was brought out in 1741, for the benefit of the Foundling Hospital. It was not much appreciated at the first representation, but increased in reputation every year. In 1742 the *Samson* appeared, in 1746 the *Judas Maccabæus*, in 1748 the *Solomon*, and in 1752 the *Jephthah*. In 1752 he became blind, but did not lose his spirits, continuing to perform in public and even to compose. He died at London in 1759, and was buried in Westminster Abbey. Händel was of large and ungainly person. His manners were rough and his temper violent, but his disposition was humane and liberal. As a musician his characteristics are boldness and strength of style and combination of vigor, spirit, and invention in his instrumental compositions.

Hand-fish. See *Cheironectes*.

Handicapping, in horse-racing and various other games and sports, a system of equalizing the chances of victory in favor of each of the competitors by allowing certain advantages to an inferior competitor, as, in horse-racing, the making the best horses carry heavier weights proportionably to their racing qualities, or, in chess-playing, the stronger player giving up one or more of his men at the beginning of the game.

Hand-language. See *Deaf and Dumb*.

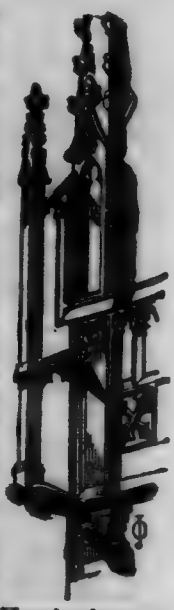
Hand-plant, the *Cheirostēmon platanoides*, a Mexican tree of the order Sterculiaceæ. It grows about 30 feet or more in height, and has flowers, the stamens of which present an appearance somewhat like that of the human hand.

Hands, LAYING ON OF. This rite, as a token of blessing, or the communication of spiritual gifts, or of something else which could not be literally delivered into the hands of another, has been in use from the earliest times. It occurs in Scripture as a patriarchal usage, appropriate and becoming perhaps rather than strictly religious, but later assumes more of the character of a formal rite, as in the ritual of animal sacrifice amongst the Jews, when the officer was required to lay his hands on the victim while still alive, except in the case of the paschal lamb. In the early church this rite was used in benediction, absolution, the unction of the sick, and the reconciliation of penitents as well as in ordination and confirmation. The rite is still retained by most western churches in the ceremony of ordination, and in the Roman Catholic, Anglican, and Lutheran churches both in confirmation and ordination.

Hang-Chow (häng'chou'), or HANG-CHOO, a large city, capital of the province of Chekiang, China, on the estuary of the Tsien-tang-kiang. It is one of the handsomest cities of China, with many magnificent temples, monuments, and triumphal arches. It has extensive manufactures in silks, furs, gold and silver ornaments, tapestries, lacquered ware, fans, etc., and a large trade. The larger portion of the inhabitants live without the walls in the beautiful suburbs and in boats on the river. It is also a great center of literary and ecclesiastical life. Pop. (1912) 594,000.

Hanging, as a mode of execution. See *Capital Punishment*.

Hanging-buttress, in architecture, a buttress not standing solid on a foundation, but supported on a corbel. It is applied chiefly as a decoration.


Hanging-buttress.

Hanging Gardens. The Hanging Gardens of Babylon were anciently reckoned among the wonders of the world. Their construction has been variously ascribed to the legendary Queen Semiramis and to Nebuchadnezzar. Diodorus and Strabo have given descriptions of them. They are said to have formed a square, with an area of nearly four acres, and rose in terraces, supported on masonry arches, to a height of 75 feet. They were irrigated from a reservoir built at the top, to which water was lifted from the Euphrates by a screw.

Hang-nest (*Icteridæ*), a popular name given to the American orioles, a family of finch-like perching birds, of brilliant black and color, the best known being the Baltimore oriole. They are so called from their curious purse-like nests, often about two feet long, with a hole for entrance near the bottom. See *Oriole*.

Hankow (hän'kou'; 'Mouth of the Han'), a town and river-port in China, in the province of Hupeh, at the junction of the Han with the Yang-tse-kiang; Han-yang being on the opposite bank of the Han, and Wuchang on the other side of the Yang-tse. The port was opened to foreign trade in 1862, and has become the chief emporium for the green-tea districts in the central provinces, which formerly sent their produce for export to Canton. Large steamers ascend to the town. In 1857 Hankow fell into the hands of the Taiping rebels, and was almost completely demolished by them. Pop. estimated at 850,000.

Hanley (han'li), a municipal and parliamentary borough of North Staffordshire, England, pleasantly situated on rising ground near the Trent, 18 miles north by west of the county town of Stafford. It is quite a modern town, owing its growth entirely to the vast manufactures of china and earthenware in which the inhabitants are mostly employed; but there are also iron-furnaces, foundries, brickworks, and several important collieries. Pop. (1911) 66,264.

Hanna (han'a), MARCUS ALONZA, senator, born at Lisbon, Ohio, in 1837; died in 1904. He grew wealthy in business, became active in political affairs, was chairman of the National Republican Committee in 1896, managed the McKinley presidential campaign, and was elected United States Senator in 1897. He continued chairman of the committee in the campaign of 1900.

Hannan (han'an), FREDERICK WATSON (1866-), an American Methodist Episcopal clergyman and theological instructor, born at Cochecton, N. Y., educated at Hackettstown Collegiate Institute and Wesleyan University, Conn. He was graduated from the Drew Theological Seminary in 1893, ordained to the Methodist Episcopal ministry and became pastor of a church at Bayport, N. Y. the same year. He was pastor of the First Church of Meriden, Conn., from 1894 to 1898, and pastor of the First Church of Waterbury, Conn., 1898-1901. Removing to Brooklyn he became pastor of the Bushwick Avenue Church in 1901, remaining there till 1909, when he accepted a call to the New York Avenue Church of Brooklyn. In 1913 he resigned the pastorate of the New York Avenue Church and became professor of Biblical Theology at the Drew Theological Seminary, Madison, N. J.

Hannay, JAMES, a Scotchman of letters, born at Dumfries in 1827; died at Barcelona in 1873. At an early age he entered the navy, but left it in 1845 to become a reporter on the *Morning Chronicle* in London. In 1860 he went to Edinburgh as editor of the Edinburgh *Courant*, but resigned this post in 1864. In 1868 he was appoined British consul at Barcelona. He wrote several novels, among which *Singleton Fontenoy* and *Eustace Conyers* are the best.

Hannibal (han'ni-bal), or ANNIBAL, one of the greatest generals of antiquity, born B.C. 247, was the son of Hamilcar Barca, also a general and leader of the popular party among the Carthaginians. He was but nine years of age when his father made him swear at the altar eternal hatred to the Romans. He grew up in his father's camp in Spain (see *Hamilcar*), but returned to Carthage when his father fell in battle, in 229 B.C. At the age of twenty-two he returned to the army in Spain, then commanded by his brother-in-law Hasdrubal, and three years after, on the murder of Hasdrubal, received the chief command by acclamation. Hannibal now prepared to carry out his great designs against Rome. His siege and capture of Saguntum, a city in alliance with Rome, led to a declaration of war from the Romans, who made preparations to carry on the war in Spain. But Hannibal, judging that Rome could be overthrown only in Italy, undertook his great march on Rome across the Pyrenees, the Rhône, and the Alps. He set out with 90,000 foot-soldiers, 40 elephants, and 12,000 horsemen. When he reached the northern foot of the Alps he had still 50,000 foot-soldiers, 9000 horse, and 37 elephants. When he arrived at the southern foot, after 15 days of incredible toils, his force had diminished to 20,000 foot-soldiers and 6000 horse. The point at which he crossed is generally believed to have been the Little St. Bernard. On the banks of the Ticino he first encountered a Roman army under Publius Scipio, and defeated it mainly by the superiority of his Numidian cavalry, 218 B.C. Shortly after another Roman army, under Sempronius, was totally routed on the Trebia. After wintering in Cisalpine Gaul, Hannibal opened next year's campaign (217) by defeating the Roman general Flaminius, whom he enticed into an ambush at Lake Thrasymenus. In this battle half the Roman army perished, and

the rest were taken prisoners. Hannibal now marched into Apulia, spreading terror wherever he approached. Rome, in consternation, proclaimed Fabius Maximus dictator, who sagaciously resolved to hasard no more open battles, but exhaust the strength of the Carthaginians by delay. But for some time the wisdom of this policy was not understood by his countrymen, who, dissatisfied with his inactivity, appointed Minutius Felix his colleague. The result was that the latter was drawn into a battle by Hannibal, and would have perished but for the aid of Fabius. After this the Roman generals avoided engagements, and Hannibal at this critical period saw his army wasting away in inactivity. Next year (216), however, the rashness of the new consul Terentius Varro gave Hannibal the last of his great victories. The battle was fought at Cannæ, the Romans under L. Æmilius Paulus and Varro numbering more than 80,000 men, the Carthaginians about 50,000, and ended in a total defeat of the Romans, 40,000 or 50,000 of whom were slain and the rest scattered. Instead of marching on Rome, Hannibal now sought quarters in Capua, where luxurious living undermined the discipline and health of his troops. The campaigns of 215, 214, and 213 were comparatively unimportant. While Hannibal was seizing Tarentum (212), Capua was invested by two Roman armies. To relieve Capua Hannibal marched on Rome, and actually appeared before its gates (211), but the diversion remained fruitless, and Capua fell. In 207 a reinforcement tardily sent by the Carthaginians to Hannibal, under command of his brother Hasdrubal, was intercepted by the Romans and destroyed at the Metaurus. Hannibal now retired to Bruttium (the toe of Italy), where he still maintained the contest against overwhelming odds, till, in 203, he was recalled to defend his country, invaded by Scipio. In Africa he was defeated by the Romans at Zama (202 B.C.), and the second Punic war ended, after a bloody contest of eighteen years, in Carthage having to accept the most humiliating conditions of peace. Hannibal now devoted himself as civil magistrate to restoring the resources of Carthage, and was working at reforms of administration and finance when the jealous Romans sent ambassadors to demand his surrender. He fled to the court of Antiochus of Syria, and offered his services for the war then commencing against the Romans. They were accepted, but Hannibal's advice for the conduct of the war was not followed, and he himself as commander of the Syrian fleet failed in an expedition against the Rhodians. In 190 B.C. Antiochus was forced to conclude a disgraceful peace with the Romans, one of the terms of which was that Hannibal should be delivered up. Hannibal, again obliged to flee, took refuge with Prusias, king of Bithynia, and is said to have gained several victories for Prusias against Eumenes, king of Pergamus, an ally of the Romans. But the Roman senate once more sent to demand the surrender of their inveterate enemy, and Hannibal, finding that Prusias could not protect him, took poison rather than fall into the hands of the Romans. He died in B.C. 183.

Hannibal, a city of Marion County, Missouri, on the west bank of the Mississippi, 120 miles north of St. Louis; served by four railroads. It is the boyhood home of Mark Twain. The chief manufactures are cement, lime, shoes, car wheels, stoves, structural steel, flour, wagons and boxes. Pop. 20,000.

Hanno (han'nō), a Carthaginian navigator of the fifth and sixth centuries B.C., who made a voyage on the western coast of Africa for the purpose of discovery and of settling colonies. He wrote an account of his voyage, which still survives in a Greek translation known as the *Periplus of Hanno*. From this account Hanno would appear to have gone as far as the coast of Guinea.

Hanoi (hä-noi'), or KẺSH'O, capital of Tonquin, on the river Songka, in a fruitful plain. Gold and silver filigree, lacquered wares, silks, mat and basket weaving are its principal industries. Although the river is navigable only for small vessels the trade of Hanoi is considerable, chiefly with the southern provinces of China. Pop. variously estimated at over 100,000.

Hanover (han'ō-vẽr; Ger. *Hanno ver*), formerly a kingdom in the northwest of Germany, now a province of Prussia. It is of very irregular shape, and is divided by intervening territories into three distinct portions, besides some small territories to the south, and a range of sandy islands lining the coast. The total area is 14,857 sq. miles. For administrative purposes it is divided into six districts—Hanover, Hildesheim, Lüneburg, Stade, Osnabrück, Aurich. The surface in the south is covered by the Harz Mountains, but the rest of the country is a low, monotonous flat, with a gentle slope to the North Sea. The Ems, the Weser (with its tributaries the Leine and Aller), and the Elbe flow through fertile districts industriously cultivated for corn and flax. Near the coast the land is marshy, but feeds large numbers of very superior cat-

tle. In Central Hanover the soil is of a barren, sandy nature. The Harz Mountains are rich in minerals, the working of which is an important industry.—Hanover was long connected with the Brunswick family, and latterly more especially with the line of Brunswick-Lüneburg. Ernest Augustus, a prince of the latter line, became in 1692 the first Elector of Hanover, married a granddaughter of James I of England, and was succeeded in 1698 by his son, George Louis, who in 1714 became George I of England. Henceforth it was ruled in connection with England. In 1814 the Congress of Vienna raised Hanover to the rank of a kingdom, the crown of which was worn by George IV and William IV, but on the accession of Queen Victoria, passed by Salic law to Ernest Augustus, duke of Cumberland. In 1851 he was succeeded by his son, George V, but in 1866, Hanover having become seriously involved in the Austro-Prussian contest, his kingdom was conquered and absorbed by Prussia. Pop. (1905) 2,759,699.

Hanover, capital of the Prussian province of Hanover, situated in an extensive plain on the Leine, which here receives the Ihme and becomes navigable. The old town, irregularly built and with many antiquated buildings, is surrounded by the handsome new quarters which have arisen to the north, east, and southeast. There are fine promenades, and a large wood with beautiful walks, the Eilenriede, lies on the eastern side of the city. Amongst the principal buildings are the Market Church, the old town-house, the theater, one of the finest in Germany, the royal palace, the Museum of Art and Science, the Royal Library, containing 175,000 volumes, the Central Railway Station, the Waterloo Monument, etc. About a mile to the N. W. is Schloss Herrenhausen, the favorite residence of George I, George II, and George V. Nearer the town is the colossal Welfenschloss, or palace of the Guelphs, now fitted up as a polytechnic school. Hanover is a manufacturing town of some importance, has cotton-spinning, machine works, iron foundries, chemical works, tobacco and cigar factories, etc. Hanover is first mentioned in 1163. It joined the Hanseatic League in 1481. It became the residence of the dukes of Brunswick-Lüneburg, and capital of the principality in 1636. Pop. (1910) 302,978.

Hanover, a village of Grafton County, New Hampshire, near the Connecticut River and 76 miles N. W. of Concord. It is chiefly notable as the seat of Dartmouth College, founded in 1769 and prominent among our collegiate institutions. Pop. 2075.

Hanover, a borough of York County, Pennsylvania, 26 miles S. W. of York. It has foundries, machine shops, cigar-box, wire, cloth, glove, and various other factories. Pop. 7057.

Hanse Towns (hans), certain German and other commercial cities of Northern Europe formerly associated for the protection of commerce and united by what was called the *Hanseatic League*. In the middle of the thirteenth century the sea and land swarmed with pirates and robbers. In particular the thriving ports of the Baltic and the North Sea were infested, and in 1219 a compact was made between Hamburg, Ditmarsh, and Hadeln to protect the adjacent waters. This was followed in 1241 by an alliance between Hamburg and Lübeck to keep open the road across Holstein, connecting the North Sea with the Baltic. In 1247 this league was joined by Brunswick, and out of this grew the Hansa or league, which at its most flourishing period embraced 85 towns, maritime and inland, from Reval and Narva to Amsterdam and Middleburg, and from Cologne to Breslau and Cracow. Among these the town of Lübeck was recognized as the chief town of the league. Here assembled the deputies of the other Hanse towns to deliberate on the affairs of the confederacy; but the decrees of the diet had no effect unless they received the sanction of the separate towns. The chief trading centers of the league were the factories of Novgorod in Russia, Bergen in Norway, Bruges, and London (the so-called Steelyard). These factories were subject to an almost monastic discipline, which even required their officers to be celibates and live at a common table. During the latter half of the fourteenth century the power of the league was at its height. It had armies and navies, gained victories in war over the kings of Norway and Denmark, and deposed a king of Sweden. It made thorough provision for the security of commerce on the Baltic and North Seas, constructed canals, introduced a uniform system of weights and measures, and developed the principles of mercantile law. But as its power and ambition increased it was felt to be an oppressive monopoly established mainly in the interests of the great seaport towns. It became less needful also for commercial security, as the princes learned the advantages of trade, formed naval forces of their own, and encouraged navigation. Most of the inland members of the confederation withdrew, and during the fifteenth and sixteenth

centuries the cities of Hamburg, Lüneburg, and Lübeck were almost alone in their active efforts to maintain the power of the Hansa and secure for it the command of the Baltic. About the middle of the sixteenth century the Dutch became predominant in the Baltic trade. In 1597 England revoked all special privileges of the Hanseatic merchants, and in 1614 Lübeck, Stettin, Dansig, Brunswick, Lüneburg, Hamburg, Bremen, and Cologne, with a few smaller towns, were the only places that contributed to the support of the Hansa. The league still made desperate efforts to retain its monopolies, but the cost of doing so now became a heavy tax on the remaining allies. At the last general assembly, held in 1630 at Lübeck, many of the members sent representatives only to renounce their allegiance. The name still remained attached to the free cities of Lübeck, Bremen, and Hamburg, under whose protection the surviving factories continued to exist, that of Bergen being still managed in the old way till 1763. In 1813 Frankfort-on-the-Main was included in the number of the Hanse towns, and in the German Confederation these four cities had together one vote in the diet. Frankfort was incorporated with Prussia in 1866, but the other three towns are still separate constituents of the German Empire.

Hansi (hän'sē), a town of Hissar district, Punjab, on the western Jumna Canal. Pop. about 15,000.

Hansom-cab, a two-wheeled hackney carriage or cabriolet used in the cities and large towns of Britain and the United States, and named after the inventor. It holds two persons besides the driver, who sits on an elevated seat behind the body of the carriage, the reins being brought over the top.

Hanswurst (hȧns'wurst), the name of a standing comic character on the older German stage, corresponding in its grotesque traits and mirth-making qualities to the English clown or Italian harlequin. The name is equivalent to the Jack Pudding of England.

Hants. See *Hampshire.*

Hanumân (han-ö-mân'), in Indian mythology, the name of a fabulous monkey-god, who plays a prominent part in the epic Râmâyana. As the monkey-general who aided Rama (the seventh incarnation of Vishnu) in his war against the giant Ravana, he is worshiped as a demi-god, and on his account the whole tribe of monkeys, to which he is fabled to belong, is treated as sacred and allowed to multiply indefinitely.

Hanway (han'wā), Jonas, an English traveler and philanthropist, born in 1712. At an early age he was apprenticed to a merchant at Lisbon, and in 1743 became a partner in a British house at St. Petersburg. He traveled in Persia, and published *An Historical Account of the British Trade over the Caspian Sea.* Later he settled in London, where he became widely known as an active philanthropist. He is popularly known as one of the first Englishmen to persist in the regular use of an umbrella. He died in 1786.

Hapsburg (haps'burg; properly *Habichtsburg* or *Habsburg*, the hawk's castle), a small place in the Swiss Canton of Aargau, on the right bank of the Aar. The castle was built about 1027 by Bishop Werner of Strassburg. Werner II, who died in 1096, is said to have been the first to assume the title of Count of Hapsburg. After the death, about 1232, of Rudolph II, the family divided into two branches, the founder of one of which was Albert IV. In 1273 Rudolph, son of Albert IV, was chosen Emperor of Germany, and from him descended the series of Austrian monarchs all of the Hapsburg male line, down to Charles VI inclusive. After that the dynasty, by the marriage of Maria Theresa to Francis Stephen of Lorraine, became the Hapsburg-Lorraine. Francis II, the third of this line, was the last of the so-called 'Holy Roman Emperors,' this old title being changed by him for that of Emperor of Austria. From the Emperor Rudolph was also descended a Spanish dynasty which began with the Emperor Charles V (Charles I of Spain), and terminated with Charles II in 1700. The castle of Hapsburg is still to be seen on the Wülpelsberg.

Hapur (hą-pör'), a town of India, in the Meerut district, North-western Provinces. It has a considerable trade in sugar, grain, cotton, timber, etc. Pop. about 18,000.

Harakiri (har'a-ki-ri), or Sep'puku, a mode of inflicting death upon themselves allowed in Japan to criminals of the Samurai or two-sworded class as more honorable than public execution. It consists in cutting open the body so as to disembowel it by means of a wound made with one sword perpendicularly down the front and another with the other sword horizontally. It is (or was) frequently resorted to to save dishonor or exposure, and was done by the Japanese to prevent capture in war.

Harar (hä-rär'), a city of Northeastern Africa, about 150 miles from the coast of the Gulf of Aden. It is the center of a small district governed as an independent sovereignty by an emir. The inhabitants are strict Mohammedans. Pop. variously estimated from 30,000 to 40,000.

Harbin (här'bin), or KHARBIN, a railway town on the Sungari River, in Northern Manchuria, 615 miles N. E. of Port Arthur, 350 miles N. W. of Vladivostok. It was founded by Russia in 1896 at the junction of the Trans-Siberian Railway with the South Manchurian line to Port Arthur, as a railway and military center, and has now a population estimated at over 70,000. It has steamboat connections via the Sungari with the Amur and is a trading center. In 1904 it was an important depôt of supplies for the Russian army during the war with Japan.

Harbor (här'bur), a general name given to any bay, creek, or inlet of the sea affording accommodation for ships and protection against the wind and sea. The great requisites of a good harbor are accessibility, adequate depth of water, and shelter from violence of wind and water. Harbors are either natural or artificial, the latter being made wholly or partly by the construction of moles or breakwaters. In connection with the more important harbors there are usually docks, in which the water is kept as nearly as possible at the same level, thus giving facility in loading and unloading. See *Breakwater* and *Docks*.

Harbor Grace, a seaport of Newfoundland, on the west side of Conception Bay. It is the seat of a Roman Catholic bishop, has a handsome cathedral, and an active trade. Pop. 5184.

Harburg (här'bourg), a town in Prussia, in the province of Hanover, on the left bank of the South Elbe, opposite to Hamburg. It has varied manufactures and an important trade. Pop. (1910) 67,028.

Harcourt (här'cŏrt), SIR WILLIAM GEORGE GRANVILLE VENABLES VERNON, lawyer and politician, son of the late Rev. William Vernon Harcourt, was born in 1827. He was educated at Trinity College, Cambridge, was called to the bar in 1854, became Queen's Counsel in 1866; contributed frequently to the press, in particular the letters to the *Times* signed 'Historicus.' He was returned for Oxford city in 1868 in the Liberal interest and distinguished himself by his powers of satire and ridicule in debate; was made solicitor-general in Mr. Gladstone's ministry, Nov., 1873; home secretary in 1880, when he lost his seat for Oxford but was returned for Derby. In Feb., 1886, he was made chancellor of the exchequer; and after the resignation of Mr. Gladstone's ministry became a prominent leader of the Gladstonian section; in 1892 he was reappointed chancellor of the exchequer. He died in 1904.

Hardangerfjord (här-däng'ər-fyord), a fjord on the west coast of Southern Norway, with magnificent scenery.

Hardee (här'dē), WILLIAM J., soldier, born at Savannah, Georgia about 1818; graduated at West Point in 1838; became captain in 1844, and joined the Confederate army in 1861. He served as major-general at the battle of Shiloh, and was appointed lieutenant-general in October, 1862. He fought at Stone River and in several later battles, and unsuccessfully defended Savannah against Sherman in 1864. His work on *Tactics* was long an authority. He died in 1873.

Hardenberg (här'den-bĕrg), FRIEDRICH VON, German writer, better known under the name of *Novalis*, was born in 1772; died in 1801. He studied at Jena, Leipsig, and Wittenberg, was the friend of Tieck and the Schlegels, and spent his brief life in study and literary production. He was one of the leaders of the 'romantic school,' and his writings are a strange mixture of imagination, profundity and mysticism. Amongst his works are an unfinished novel, *Heinrich von Ofterdingen*, and *Spiritual Songs*.

Hardenberg, KARL AUGUST, PRINCE VON, Prussian chancellor of state, was born at Essenrode, in Hanover, in 1750. He entered the civil service of his country, but left it for that of Brunswick, and next became Prussian minister of state, and in 1804 first minister of Prussia. His conduct was vacillating, now favoring an alliance with Napoleon and again hostile to him. After the Peace of Tilsit, he was banished from the Prussian court by command of Napoleon, was recalled to office as chancellor in 1810, and after the French disaster at Moscow was amongst the first to declare that the time had now come for a general effort against Napoleon. Hardenberg signed the Peace of Paris, and was created prince. He was one of the most prominent actors at the Congress of Vienna; became president of the Prussian council of state; was present in 1818 at the Congress of Aix-la-Chapelle; in 1819 at Carlsbad; in 1820 at Troppau; in 1820-21 at Laibach; and in 1822 at Ve-

reme. He died in 1822. He abolished feudal privileges in Prussia, and was a munificent patron of the sciences.

Harderwijk (här'dėr-vik), a town of the Netherlands, in the province of Gelderland, on the Zuider Zee, 30 miles east of Amsterdam. Pop. 7425.

Hard-hack, the American popular name of a plant, the *Spiræa tomentosa*, common in pastures and low grounds, and celebrated for its astringent properties, which cause it to be used medicinally.

Hardicanute (här-di-kȧ-nūt'), or HARTHCANUT, King of England and Denmark, was the only legitimate son of Canute. At the time of his father's death, in 1036, he was in Denmark, where he was immediately recognised as king. His half-brother Harold, however, who happened to be in England at the time, laid claim to the throne of that part of their father's dominions, and succeeded in getting possession of Mercia, Northumbria, and Wessex, but died in 1040, when Hardicanute peacefully succeeded him. He reigned till 1042, leaving the government almost entirely in the hands of his mother and the powerful Earl Godwin, while he gave himself up to feasts and carousals.

Hardie, JAMES KEIR, British labor leader, born in Scotland, August 15, 1856, of working-class parents, and began earning his living in a coalpit at the age of eight. He afterwards worked in a mine until he was twenty-four, when he became secretary to the Lanarkshire Miners' Union. He edited the *Cumnock News* (1882–86), and founded the *Labor Leader*, a weekly newspaper, devoted to the advocacy of socialism and the rights of labor. He has had a great influence on the British Labor movement, was the first Labor member, distinct from the two great parties, to sit in the British Parliament, and was the first chairman of the Labor party, in the House of Commons (1906). He was a leader of the dockers' strike at the Port of London (1890), and the Scotch railroad strike (1892). In 1907–8 he visited India and roused opposition in Anglo-Indian circles by his violent speeches. He died in 1915.

Hardinge (här'ding), HENRY, VISCOUNT, an English commander, was a son of the Rev. Henry Hardinge, rector of Stanhope, Durham, and was born in 1785. He was gazetted ensign in 1798, and was present at all the great battles and sieges in the Peninsula. He lost his left hand at the battle of Ligny. He became M. P. for Durham in 1820, was made secretary-at-war, secretary for Ireland, and in 1844 succeeded Lord Ellenborough as governor-general of India. Being forced into war by an invasion of Sikhs he took a command under Lord Gough, and after the great battles of Mudki, Ferozeshah, and Sobraon dictated a peace in the Sikh capital of Lahore. In reward of his services he was created Viscount Hardinge and received a pension of £3000. In 1852, on the death of the Duke of Wellington, he succeeded to the post of commander-in-chief. In 1855 he was made a field-marshal, and he died in 1856.

Hardness (hȧrd'nes), the quality of bodies which enables them to resist abrasion of their surfaces. In mineralogy a scale is used in which a set of standard bodies are arranged and numbered, and other bodies are referred to this scale with respect to hardness. The following is the scale given by F. Mohs:—talc 1, rock-salt 2, calcspar 3, fluorspar 4, apatite 5, felspar 6, quartz or rock-crystals 7, topaz 8, corundum 9, diamond 10. Materials, according to this arrangement, which are scratched by rock-crystal and are not scratched by felspar are said to have a hardness between 6 and 7.

Hardoi (hur'dō-ē), a town of India, administrative headquarters of Hardoi district, Oudh, 63 miles from Lucknow. Pop. 12,174.

Hardouin (ȧr-dō-an), JEAN, a learned French Jesuit, born in 1646; died in 1729. He maintained the extraordinary hypothesis that all the writings under the names of the Greek and Roman poets and historians, except those of Homer, Herodotus, Cicero, and Pliny the Elder, the satires and epistles of Horace, and the Georgics of Virgil, are the spurious productions of the thirteenth century, written by monks under the direction of one Severus Archontius.

Hardpan, a strata of hardened clay, sand, or gravel, several feet under the soft upper soil, for which it serves as a foundation, and aids in holding water. It has become a popular term for the lowest point of descent in any state of affairs.

Hardtack, large, hard biscuits or crackers made for the use of soldiers on the march. About 14 of these weigh a pound and about 20 are served daily to marching soldiers.

Hardwar (hur-dwär'), a town of India, in Saharanpur district, Northwestern Provinces. It is situated on the Ganges, and is one of the principal places of Hindu pilgrimage, and of the ceremonial of bathing in the sacred

river. The town is of great antiquity and has interesting ruins. Pop. 25,597.

Hardware (hârd'wâr), the name usually given to the commoner articles made of iron, brass, and copper. The manufacture of such articles now forms a gigantic industry in Great Britain, especially in England, where its chief seats are Birmingham and Sheffield.

Hardwood Trees, are usually trees of slow growth, such as the oak, beech, witch-elm, elm, ash, service-tree, walnut, chestnut, acacia, etc., the tissue of which is firm and close. They are distinguished from softwooded trees such as the willow, poplar, etc., and resinous trees such as the pine, fir, cedar, larch, etc.

Hardy (hâr'di), THOMAS, novelist, born in Dorsetshire, England, in 1840. He served an apprenticeship as an ecclesiastical architect; published his first novel, *Desperate Remedies*, in 1872, and has since continued a series of favorite fictions. His best known work is *Far from the Madding Crowd*, with its fine air of rural life. Others are *The Hand of Ethelberta*, *The Trumpet Major*, *The Woodlanders*, *The Return of the Native*, *The Mayor of Casterbridge*, *Tess of the D'Urbervilles*, etc.

Hare (hâr), the common name of the rodent quadrupeds of the genus *Lepus* with long ears, long hind limbs, a short tail, soft hair, and a divided upper lip; its dental formula is: incisors $\frac{4}{2}$, canines $\frac{0}{0}$, molars $\frac{6}{6} - \frac{6}{6} = 28$; the two forefeet have five and the hinder four toes. They run by a kind of leaping pace. The females produce litters of three to six about four times a year. The young leverets have their eyes open at birth. The common hare (*L. timidus*) is found throughout Europe and some parts of Asia. It is tawny red on the back and white on the belly, and is about 2 ft. long. The mountain hare or varying hare (*L. variabilis*), confined to Northern Europe and the mountainous regions of the south, is smaller than the common hare, and becomes white in winter. *L. cuniculus* is the rabbit, properly so called, distinguished by its smaller size and burrowing habits. (See *Rabbit*.) The American hare (*L. Americanus*), not much larger than a rabbit, is found in most parts of North America. In North America there are also the polar hare (*L. glacialis*), a variety of the varying hare (*L. variabilis*), but of superior size and purer color; and the prairie hare (*L. campestris*), one of the species known as jackass hares or Jack-rabbits, from their size and length of limb. The hare, which has no courage and little cunning, is protected from its enemies mainly by the acuteness of its sight and hearing and its extraordinary swiftness of foot. Its voice is never heard except when seized or wounded, when it utters a sharp loud cry, not very unlike that of a child. Its flesh is rather dry, but is much prized for its peculiar flavor.

Hare, JULIUS CHARLES, an English writer on theological and social subjects, born in 1796; died in 1855. He was educated at the Charterhouse, and Trinity College, Cambridge. In 1832 he became rector of Herstmonceaux, in 1840 was appointed Archdeacon of Lewes, in 1851 obtained a prebend in Chichester Cathedral, and in 1853 became one of the queen's chaplains. In concert with his brother, Augustus William Hare, he published a well-known work entitled *Guesses at Truth by Two Brothers*. His other writings include several volumes of sermons; a *Memoir of John Sterling*, prefixed to a collection of his writings; and a *Vindication of Luther Against His Recent English Assailants*.

Hare, ROBERT, chemist, born at Philadelphia, Pennsylvania, in 1781; died in 1858. He was professor of chemistry in the University of Pennsylvania, 1818-47, and gained fame by the invention of the oxyhydrogen blowpipe. He also invented the valve-cock, the calorimeter, etc. He investigated spiritualism and became convinced of its truth, being the first scientist to accept it.

Harebell (hâr'bel), the Scotch BLUEBELL (*Campanula rotundifolia*), a plant of the nat. order Campanulaceæ, common on dry and hilly pastures, by roadsides, etc., in most districts of Europe, with a bell-shaped blue (sometimes white) flower. The radical leaves are cordate or reniform, the stem-leaves partly ovate or lanceolate, partly linear. Its slender stem is from 4 to 6 inches high, and bears sometimes a single flower. Several American species of *Campanula* are known to all lovers of wild flowers.

Harebell.

Harold (har'eld; *Harelda glacialis*), the long-tailed duck, an oceanic duck having a short thick bill, a high forehead and two very long feathers in the tail of the male, whilst the females have the tail short and rounded. It inhabits the northern seas, and is frequent in Orkney and Shetland.

Harelip, a malformation consisting in a fissure or vertical division of the upper lip, sometimes extending also to the palate. Children are frequently born with this malformation, and the cleft is occasionally double. The name is given from the imagined resemblance which the part has to the upper lip of a hare. The cure of harelip is performed by cutting off quite smoothly the opposite edges of the fissure, and then bringing them together and maintaining them in accurate apposition till they have firmly united.

Harem (hâ'rem, ha'rem; Ar., 'the prohibited'), is used by Musulmans to signify the women's apartments in a household establishment, forbidden to every man except the husband and near relations. The women of the harem may consist simply of a wife and her attendants, or there may be several wives and an indefinite number of concubines or female slaves, with black eunuchs, etc. The greatest harem is that of the Sultan of Turkey. The women of the imperial harem are all slaves, generally Circassians or Georgians. Their life is spent in bathing, dressing, walking in the gardens, witnessing the voluptuous dances performed by their slaves, etc. The women of other Turks enjoy the society of their friends at the baths or in each other's houses, and appear in public accompanied by slaves and eunuchs; but the women of the Sultan's harem have none of these privileges. It is of course only the richer Moslems who can maintain harems; the poorer classes have generally but one wife.

Hare's Ear (*Bupleurum*), a plant of the nat. order Umbelliferæ. The most common European species (*B. rotundifolium*) flourishes best on a chalky soil. Under the name of *thorough-wax* it was at one time used as a vulnerary.

Harfleur (ar-fleur), a town of France, dep. of Seine-Inférieure, on the Lezarde, near its entrance into the Seine, 6 miles east of Havre, once the chief port at the mouth of the Seine. Pop. 2612.

Hargreaves (hâr'grēvz), Edmund X, explorer, born in Gosport, England, in 1815; became a gold-digger in California in 1849, and being struck with the similarity in geological formation between California and Australia, believed that gold existed in the latter. This he proved in 1850 by discovering gold in the Blue Hills of New South Wales. He was appointed commissioner of crown lands and received an award of $50,000. He died in 1891.

Hargreaves (hâr'grēvz), James, an English inventor, author of two important improvements in the art of cotton-spinning, was born near Blackburn about 1720; died in 1778. In 1760 he invented a machine for carding, and some years after the spinning-jenny, by which he was able to spin with several spindles at once.

Haricot (har'i-kō), a general term for various species of kidney-bean, genus *Phaseolus*. They constitute a palatable and nutritious article of diet.

Häring (hā'ring), Wilhelm, best known as Willibald Alexis, a German novelist, born in 1797; died in 1871. He adopted law as a profession, but gave it up in favor of literature. In 1823 and 1827 respectively he published the novels *Walladmor* and *Schloss Avalon*, which were translated into English and other languages. These were followed by a long series of writings, consisting not only of novels and novelettes, but of books of travel, plays, ballads, etc. His most important works, however, were historic novels, such as *Cabanis*, *Roland von Berlin*, *Der Falsche Waldemar*, etc.

Harington (har'ing-tun), Sir John, an English poet of some merit, born in 1561; died in 1612. At his baptism Queen Elizabeth stood sponsor. He was in 1596 excluded from court on account of his poem *Metamorphoses of Ajax*, but was soon allowed to return. His best-known performance is, perhaps, his translations of *Orlando Furioso* in heroic verse.

Harîri (har'ē-rē), Abu Mohammed el Kasem Ben Ali, surnamed El Harîri, or the silk merchant, his father's occupation, a celebrated Arabic scholar and poet, who lived chiefly at Bassorah in the time of the Abbasside caliphs, born A.D. 1054; died 1121 or 1123. He is best known by his *Makâmât*, a collection of tales narrated as incidents in the life of the hero *Abu Zeid*, a clever impostor who adopts every career in life, and succeeds in all to admiration.

Harlan, John Marshall, American jurist, born in Kentucky in 1833; died in 1911. In 1861 he organized the Tenth Kentucky Regiment, of which he was colonel until 1863, when he became attorney-general of Kentucky. In 1877 he became an Associate Justice of the United States Supreme Court, in which position he showed himself a liberal constructionist. In 1889 he became professor of law in the George Washington University. He was a member of the Bering Sea Tribunal in 1892.

Harland, Marion. See *Terhune, Mary Virginia.*

Harlebeke, or HARLEBEKEN (här'le-bā-ke), a town in Belgium, in West Flanders, on the Lys. It is said to be the oldest town in Flanders, and has a beautiful parish church, and a pulpit regarded as a masterpiece of carving. Pop. 7396.

Harleian Library. *See Harley.*

Harlequin (här'le-kwin; Fr. *arlequin*; Ital. *arlecchino*), a character in the Italian comedy. On the Italian stage he is a comic character, full of [illegible] and knaveries, and somewhat resembles the English clown. The harlequin of British pantomime is quite different. He is supposed to be the lover of the Columbine, and possesses a wonder-working wand, with which he protects his mistress against the clown and pantaloon, who pursue and endeavor to capture her, until the pursuit is brought to a termination by a good fairy. The harlequin wears a tight dress of bright colors, now glittering with spangles. *See Clown.*

Harlequin Duck (*Clangula histrionica*), a species of duck, so called on account of its party-colored plumage of white, gray, and black. It inhabits the Arctic regions. At Hudson Bay it is called the *Painted Duck;* along the coast of New England the *Lord.* In length it is about 17 inches. The bill is of a lead color, tipped with red. The upper part of the head is black. Between the eye and the tail is a broad space of white, extending over the eye, and ending in a reddish color. The neck is black and is encircled at the base with a line of white. The belly and upper body are black; the sides chestnut. It swims and dives well and is frequently seen in deep water considerably out at sea. It bred in Audubon's time in Nova Scotia and Labrador.

Harley (här'li), CHARLES RICHARD (1864-), an American sculptor, born at Philadelphia, educated in art at the Philadelphia Academy of Fine Arts and various schools in Paris. He was awarded a medal for sculpture at the Buffalo Exposition, 1901. Fine examples of his work are at Portsmouth, New Hampshire; Boston, Mass.; Brunswick, Maine; and the Harvard Stadium at Cambridge, Mass.

Harley, ROBERT, Earl of Oxford, an English minister, born 1661; died 1724; the son of Sir Edward Harley. After the accession of Anne he and his colleague St. John, afterwards Lord Bolingbroke, became leaders of the Tories. Harley was chosen speaker of the House of Commons in 1702 under Rochester, and in 1704 was appointed chief secretary of state, but resigned in 1[illegible]. After the fall of Marlborough Harley became chancellor of the exchequer in 1710, and next year was created Earl of Oxford. He and Bolingbroke secured the Treaty of Utrecht (1713), but afterwards quarreled. Early in the reign of George I he was impeached of high treason on the ground of his alleged Jacobite intrigues. He was kept in the Tower for two years, but, owing to the inability of the Peers and the Commons to agree about the mode of procedure he was acquitted. His patronage was extended to Swift, Pope, and other literary men, and he made a valuable collection of books and MSS., which latter are preserved in the British Museum, where they form the *Bibliotheca Harleiana.* Those which have been printed constitute the *Harleian Miscellany.*

Harlingen (här'ling-en), a seaport of Holland, province of Friesland, intersected by numerous canals. It has a great trade with England in corn, cattle, butter, etc. Pop. 10,448.

Harmattan (här-mat'an), a hot and dry wind, which, coming from the interior of Africa, prevails at times on the coast of Guinea in December, January, and February. Under its influence vegetation withers, and the grass becomes like hay. It is similar to the simoon of Egypt and the sirocco of Italy.

Harmodius (här-mō'di-us). See *Hippias* and *Aristogeiton.*

Harmon (här'mon), JUDSON, governor, was born at Newton, Ohio, in 1846. He studied law, became mayor of Wyoming, Ohio, in 1875; judge of the Court of Common Pleas in 1876 and of the Superior Court in 1878, and in 1895-97 was Attorney-General of the United States in the Cleveland cabinet. He became professor of law in the University of Cincinnati in 1896, and was elected governor of Ohio by the Democratic party in 1909.

Harmonica.

Harmonica (här-mon'i-ka), Franklin's name for a musical instrument constructed with glasses of different sizes, revolving by means of mech[illegible]sm

worked by the foot, and played upon by touching the rim of the glasses with the moistened finger. It constituted the 'musical glasses' of Goldsmith's era. The name is now usually applied to an instrument consisting of a series of glass keys played by two small hammers.

Harmonics (hâr-mon'iks), the accessory sounds accompanying the predominant and apparently simple tone of any string, pipe, or other sonorous body. No purely simple sound, i. e. no sound whose vibrations are all in the same period, is producible in nature. When a sound is produced by the vibration of an open string, the whole string vibrates as a unity, giving rise to a tone called the fundamental. The string, however, further divides into various sections, which vibrate separately and more rapidly, and produce sounds differing from the fundamental, but bearing certain fixed proportions to it. The first harmonic of the fundamental note of any string is that produced by half the string, and is the octave of the first; the second harmonic is given by the third of the string, and is the fifth or dominant of the fundamental note, and so on, the complete series of harmonics containing all the notes of the musical scale. But while harmonics enter into the composition of any musical sound from any vibrating body whatsoever, the different structure of different instruments suppresses now some now others of the succession of harmonics, and a different body of tone is thus produced, distinguishing a note in one instrument from the same note in another. These differences are called in English *quality*, in French *timbre*, in German *klangfarbe*.

Harmonists (hâr'mon-ists), a religious sect founded at Würtemberg about the year 1788 by two brothers called George and Frederick Rapp. They endeavored to re-establish the social practices of the early Christian church, encouraged celibacy, held all their goods in common, and taught the second advent. Persecuted by their countrymen, the followers of Rapp emigrated to America, and established themselves (1805) successfully at Harmony, in Pennsylvania. They afterwards migrated to Indiana, but this venture not proving successful, they sold their land at New Harmony to Robert Owen, the socialist, and finally settled at a place which they named Economy, 17 miles from Pittsburgh. George Rapp died in 1847, but the community still exists, though reduced to a very small number of members as a result of its policy of celibacy. It has, however, a property of great value.

Harmonium (hâr-mō'ni-um), a musical instrument of modern invention, producing sounds somewhat resembling those of the organ, resulting from the pressure of wind on a series of vibrating metallic reeds. By the action of bellows, to which the feet communicate a more or less rapid movement, the air is made to impinge against thin tongues of metal (here termed *reeds*), and to set them vibrating. These metal tongues are fitted into a slit in the top of a small box or sonorous cavity, called a wind-box, and are enabled to vibrate by being fixed only at one end. The discovery that the form of the wind-boxes determines the quality of the sound produced by the vibration of these metallic tongues contributed very much to the development of the harmonium, as it enabled the player to imitate the sound of the oboe, flute, etc. The instrument has a keyboard like that of a piano, and when one of the keys is pressed down a valve is opened, which allows the wind from the bellows to rush through one of the wind-boxes and act on the vibrator. There are several stops, by means of which the performer can direct the stream of wind into the wind-boxes which produce a flute, clarionet, or any other sound. There is also a knee action, which either serves as an expression stop, or brings all the stops of the instrument into play at once, and what is called the percussion action, which consists in the application of a small hammer, which strikes the vibrator as soon as the key is pressed down, and thus aids the action of the wind. The better class of harmoniums have now usually two or more extra rows of vibrators, which, acted upon by separate stops, add so many octaves to the compass.

Harmony. See *Music* and *Counterpoint*.

Harmony (hâr'mo-ni), EVANGELICAL, or HARMONY OF THE GOSPELS, the title of works written with a view to prove the substantial agreement of the four evangelists. The heretic Tatian composed in the second century the *Diatessaron*, the first work of this kind, a continuous narrative of the events written in the gospels. From this harmony all passages were omitted which favored the doctrine of the real humanity of Christ, and hence told against the peculiar doctrines of Tatian. Theophilus of Antioch is said to have composed a book of a similar kind, and Ammonius Saccas (died 243 A.D.) executed another *Diatessaron*, with the corresponding passages arranged in parallel columns. The *Ten Indexes* of Eusebius probably appeared in

the first half of the fourth century, and was more complete than its predecessors. Among modern harmonists are Greswell, Robinson, Tischendorf, etc.

Harmony of the Spheres, an hypothesis of Pythagoras and his school, according to which the motions of the heavenly bodies produced a music imperceptible by the ears of mortals. He supposed these motions to conform to certain fixed laws, which could be expressed in numbers corresponding to the numbers which give the harmony of sounds.

Harmotome (här'mo-tōm), or CROSS-STONE, a mineral which occurs in right rectangular prisms terminated by four rhombic planes corresponding to the solid angles of the prism; but more frequently in twin-crystals formed by the intersection of two flattened prisms at right angles to each other. Its prevailing color is white, and it is hard enough to scratch glass.

Harnack (här'nak), ADOLPH, a German theologian, born at Dorpat in 1851. In 1889 he was called to Berlin, where his lectures attracted students from all over the world. He regards the development of dogma as a deleterious process of interfusion of Greek forms of thought with the gospel teaching. His *Lehrbuch der Dogmengeschichte*, translated as the *History of Dogma* (1895-1900), is an epoch-making work.

Harness (här'nes), the various articles which are required to yoke a horse or another animal to any vehicle. See *Bit*, *Bridle*, *Saddle*, etc.

Harold I (har'old), or HARALD (*Hæger;* 'Beautiful-haired'), King of Norway, one of the greatest monarchs of that country, succeeded his father in 863. He brought all the Norwegian jarls under his power, and completely subjected the country. Of the conquered jarls, Horlf, or Rollo, emigrated to Neustria (France); others established themselves in Iceland, the Shetland Isles, the Faroes and the Orkneys. In consequence of their incursions into his dominions, Harold embarked with a naval force to subdue them, and having conquered the Orkneys, etc., returned home. He fixed his residence at Trondhjem, and died there in 933.

Harold III (*Hardrada*, 'the Hardy'), King of Norway, the son of Sigurd, a descendant of Harold Haarfager. In his youth he went to Constantinople and took part in the expedition to Italy against the African pirates. He was ultimately appointed commander of the imperial bodyguard, and defeated the Saracens. About 1042 he returned to Norway, after having, on his way through Russia, married the daughter of the Grand-duke Jaroslav. In 1047 he succeeded his nephew, Magnus the Good, as sole king of Norway. In 1066 he joined Tostig, the brother of Harold II of England, in an invasion of that country, but was defeated and slain at the battle of Stamford Bridge. See *Harold II* below.

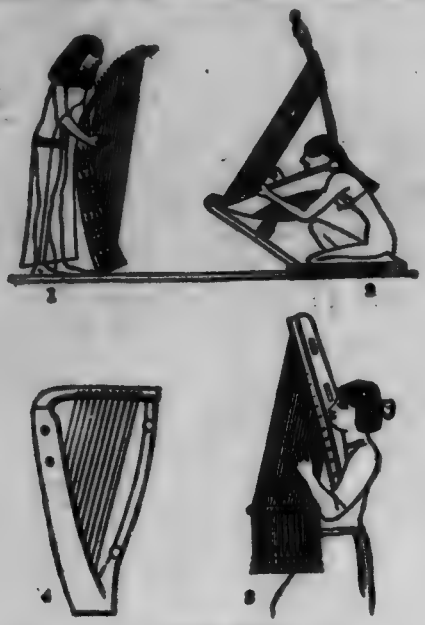
Harold I, surnamed *Harefoot*, Danish king of England, succeeded his father Canute in 1035 as king of the provinces north of the Thames, and became king of all England in 1037. His countrymen, the Danes, maintained him upon the throne against the efforts of Earl Godwin in favor of Hardicanute; and Harold later gained the earl over. After a reign of four years, he died in 1040.

Harold II, King of England, born about 1022, was the second son of Godwin, earl of Kent. On the death of Edward the Confessor, January 5, 1066, he stepped without opposition into the vacant throne, without attending to the claim of Edgar Atheling, or the asserted bequest of Edward in favor of the duke of Normandy. The latter immediately called upon him to resign the crown, and upon his refusal prepared for invasion. He also instigated Harold's brother, Tostig, to infest the northern coasts of England in conjunction with the king of Norway. (See *Harold III* above.) The united fleet of these chiefs sailed up the Humber, and landed a numerous body of men; but at Stamford Bridge, in Yorkshire, were totally routed by Harold, whose brother Tostig fell in the battle. Immediately after he heard of the landing of the duke of Normandy at Pevensey, in Sussex. Hastening thither with all the troops he could muster, a general engagement ensued at Senlac, near Hastings, October 14, 1066, in which Harold was slain, and the crown of England passed to William.

Haroun al Raschid. See *Harun al Rashid*.

Harp, a stringed instrument of great antiquity, found among the Assyrians, Egyptians, Hebrews, Greeks, Irish, Welsh, and other nations. Its variety of form and construction was only equalled by its universality. The modern instrument is well known: its form is nearly triangular, and the strings distended from the upper part to one of the sides. It stands erect, and is played with both hands, the strings being struck or pulled with both fingers and thumbs. The instrument in its ancient forms was very defective. Egyptian harps are represented with four, seven, ten, twenty, or

more strings, but we have little idea of the scale to which they were tuned. The frames are depicted as being curved in various forms, and the front pillars are wanting. The harps of the Hebrews were probably similar to the Egyptian instruments. It is probable that the various



Ancient Harps.
1, 2, Egyptian. 3, Assyrian. 4, Anglo-Saxon.

Celtic harps were derived from some oriental pattern. Among the Anglo-Saxons the harp was a favorite instrument. The modern harp was by no means an efficient instrument, until pedals were invented, an invention finally perfected by Sebastian Erard, whose patent was taken out in 1795. In 1810 he patented a double-action harp with seven pedals, each effecting two changes in the pitch of the strings. The harp thus constructed contains forty-three strings tuned according to the diatonic scale, every eighth string being a replicate in another octave of the one counted from.

Harp, Æolian. See *Æolian Harp.*

Harpe. See *La Harpe.*

Harper, William Rainey, educator; born in New Concord, Ohio, in 1856; graduated at Muskingum College in 1870. He became professor of Hebrew at the Baptist Union Theological Seminary, Chicago, in 1879-1886; of Semitic languages at Yale College in 1886-1891; president of the University of Chicago in 1891. He was very successful in promoting its interests, benefited by the liberal donations of John D. Rockefeller. He died in 1906.

Harper's Ferry, a town of West Virginia, on the Potomac River and at the mouth of the Shenandoah, 81 miles west of Baltimore. The Potomac here passes through a gorge in the Blue Ridge, and the town is notable for the beauty of its scenery and as the seat of memorable events. In 1859, John Brown, the noted abolitionist, captured the United States arsenal at this place, with a view to promote a slave insurrection. He was taken and executed. In 1862 the place was captured by Stonewall Jackson and a large garrison taken prisoners. It was the scene of other events during the Civil war. There is here a college for colored students. Pop. 766.

Harpies (här'pēz), the ancient Greek goddesses of storms. Their parentage, ages, appearance, names, and number are very differently given by the poets. In the Homeric poems they are merely storm-winds. Hesiod represents them as two young virgins of great beauty called Aëllo and Ocypete. The later poets and artists vied with each other in depicting them under the most

Harpy, from an antique gem.

hideous forms, covered with filth and polluting everything in contact with them. They are often represented as having female faces.

Harpoon (här-pön'), one of the principal instruments used for the capture of whales and large fish. See *Whale.*

Harp-seal. See *Seal.*

Harp-shell, the shell of a genus of molluscs (*Harpa*) belonging to the gasteropoda and to the whelk family. The species are found more especially at the Mauritius. The shells are very beautiful, being of brilliant color.

Harpsichord (härp'si-kord), a keyed, stringed in-

strument formerly in use, in appearance and construction similar to a grand pianoforte. In the front the keys were disposed, the long ones being the naturals, and the short ones the sharps and flats. These keys being pressed by the fingers, their inclosed extremities raised little, upright, oblong slips of wood called *jacks*, furnished with crow-quill plectrums which struck the wires, instead of the hammers of the modern pianoforte.

Harpy-eagle (*Thrasaëtus Harpyia* or *Harpyia destructor*), a rapacious bird which inhabits tropical America from Southern Mexico to Southern Brazil. It is an extremely powerful bird, and in total length slightly in excess of the golden eagle. It has, however, a somewhat shorter expanse of wing. Its shoulder muscles possess enormous strength. Its bill is powerful and crooked, and its claws are extremely strong and sharp. The harpy-eagle feeds on birds, sloths, fawns, raccoons, etc., as well as on fish, water-snakes, and the eggs of the tortoise.

Harquebuse (här'kwē-bus). See *Arquebus*.

Harraden, Beatrice, novelist, born in London about 1864. Her novel, *Ships That Pass in the Night* (1893), was very successful. Others from her pen were *In Varying Moods*, *Hilda Strafford*, etc.

Harrier (har'i-ėr), a kind of dog employed to hunt the hare. It closely resembles the foxhound, but is smaller in size.

Harrier, the name of several hawks of the genus *Circus*, allied to the buzzards. They strike their prey upon the ground and generally fly very low. The marsh-harrier, the hen-harrier, and the ash-colored harrier, are found in Europe, and the marsh-harrier (*C. æruginōsus*) in North America and Cuba. It is from 21 to 23 inches long. The hen-harrier (*C. cyanēus*) is 18 inches to 20 inches long. It is very destructive to poultry-yards, whence the name.

Harriman, Edward Henry, railroad financier, was born at Hempstead, New York, in 1847. He engaged early in the brokerage business in New York and was a member of the Stock Exchange at 22. Active and enterprising as a broker, he engaged vigorously in railroad finance, was made a director of the Illinois Central R. R. in 1883, was later its vice-president and acting president, and in 1898 secured a controlling interest in the Union Pacific R. R. He developed and greatly increased the efficiency of this road. From this basis he rapidly gained control of other roads, by aid of a daring system of financing, using the credit of one road to raise funds to purchase a controlling influence in another. In this way he gained control of the Central and Southern Pacific railroads, the Oregon Railroad and Navigation Co., and made a vigorous effort to absorb the Northern Pacific. He was defeated in this by James J. Hill, the struggle leading to the stock exchange panic of 1901. A few years of this bold and discreditable system of speculation, in which he used the property of others for his own ends, raised him to the position of the railway autocrat of the United States. In 1908 the Interstate Commerce Commission instituted an investigation of his methods, which by the time had given him dominating control of a considerable number of roads, a large interest in others, and a similar interest in many financial institutions, and had brought him enormous wealth. The only public services rendered by him were a marked improvement in the condition of the roads under his control and a scientific expedition which he sent out in 1899 to explore the wastes of Alaska and the North Pacific. He died in 1909.

Harrington (har'ing-tun), James, a celebrated political writer, born in 1611; died in 1677. Having studied under Chillingworth at Oxford, and traveled on the continent, he was, on the outbreak of the Civil war, desirous of procuring a reconciliation between the king and Parliament, but his efforts were futile. During the Protectorate he wrote his *Oceana*, which describes an ideal republic, and which was published in 1656. In the reign of Charles II he was imprisoned on a charge of plotting against the government, but was released on account of the decay of his mental faculties. In addition to the *Oceana* he also published an English translation of four books of the *Æneid*.

Harrington, Mark Walrod, astronomer, born at Syracuse, Illinois, in 1848. He graduated at the University of Michigan in 1868, was professor of astronomy in that institution and director of its observatory 1879-91, and was chief of the Weather Bureau at Washington, 1891-95. He founded the *American Meteorological Journal* in 1884 and edited it until 1892. In 1895 he was appointed vice-president of the International Meteorological Conference at Munich.

Harris, Isham Green, legislator, born in Tullahoma, Tennessee, in 1818. He was a member of Congress in 1849-53, and governor of Ten-

nessee in 1857-63. During the latter part of the Civil war he served as a staff officer in the Confederate army. He subsequently practiced law in Memphis, and in 1877 was elected United States Senator, remaining in the Senate till his death in 1897. He was unanimously elected president pro tem. of the Senate in 1893.

Harris, JOEL CHANDLER, story writer; born in Eatonton, Georgia, in 1848. He had a thorough familiarity with the negro of the post-bellum period, and while editing an Atlanta paper he produced for it the series of *Uncle Remus* sketches and songs which immediately made him known. Other works of negro lore in the same vein were *Nights With Uncle Remus*, *Mr. Rabbit at Home*, etc. As a journalist he was connected with the *Atlanta Constitutionalist*. He died in 1908.

Harris, THOMAS LAKE, religious reformer; born at Fenny Stratford, England, in 1823. He accompanied his father to the United States and became a Universalist pastor, and founded an 'Independent Christian Society,' when in 1850 he was drawn into the spiritualistic movement. He lectured in Great Britain in 1858, and on his return to the United States reorganized his society as the 'Brotherhood of the New Life.' At a later date he settled in California and established his society there. He died in 1906.

Harris, WILLIAM TORREY, educator, born at North Killingly, Connecticut, in 1835; died in 1909. He studied at Yale, and was superintendent of the St. Louis public schools 1868-80. In 1867 he became editor of the *Journal of Speculative Philosophy*. In 1889 he was appointed United States Commissioner of Education. He published many articles on philosophy, art, and education, and was a member of the Concord Summer School of Philosophy, and an officer of the French Academy.

Harrisburg (har'is-burg), a city, capital of Pennsylvania and of Dauphin County, on the Susquehanna River, 105 miles W. of Philadelphia. Several bridges here cross the river, which is a mile wide and flows through picturesque scenery. The city has handsome buildings and public monuments, including the war monument, 110 feet high. The capitol building was burned in 1897, and has been replaced by a new capitol, one of the handsomest in the United States, and remarkable for its artistic decorations. The state library has about 150,000 volumes. There are important industries, chiefly connected with iron and steel. Pop. 64,186.

Harrisburg, a city, capital of Saline County, Illinois, 66 miles N. E. of Cairo. It has flour, saw, and planing mills, brick and tile works. Coal is mined extensively. Pop. 5309.

Harrison (har'is-un), BENJAMIN, United States President, grandson of President William Henry Harrison, was born at North Bend, Ohio, in 1833. He studied law and practiced in Indianapolis, his future home. He entered the Union army in 1862 as colonel, and served through the war, receiving the brevet rank of brigadier-general. In 1876 he ran for governor of Indiana, but was defeated, and in 1880 was a candidate for the United States Senate and was elected. In 1888 he was nominated by the Republican party for President, and was elected by a majority of 65 electoral votes. He ran again in 1892, but was defeated. He died in 1901.

Harrison, FREDERICK, author, born at London, England, in 1831. He graduated at Oxford in 1853, and came to the bar in 1858. In 1877 he was made professor of jurisprudence and international law under the Council of Legal Education. He gave much time and labor to the cause of education for working men and women. He published *Order and Progress*, *Social Statics*, *Annals of an Old Manor House*, *Early Victorian Literature*, *William the Silent*, etc.

Harrison, JOHN, an English mechanician, born in Yorkshire in 1693 and died in 1776, was the son of a carpenter, and became an assistant to his father, who was occasionally employed in repairing clocks. An act of Parliament had been passed in 1714 offering rewards of £10,000, £15,000, or £20,000 for a method of ascertaining longitude within 60, 40, or 30 miles. This Harrison set himself to accomplish, but it was not till 1765 that he was fully successful, the highest award being then allotted him for the invention of his chronometer.

Harrison, THOMAS ALEXANDER, painter, was born at Philadelphia, Pennsylvania, in 1853. He became an artist, and produced many attractive landscapes, receiving for his *Le Crépuscule*, now in the Museum of Fine Arts, St. Louis, a prize of $2500. Other paintings are *In Arcady*, *Castles in Spain*, etc.

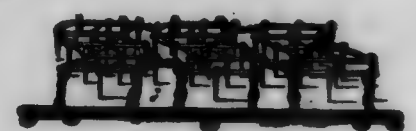
Harrison, WILLIAM HENRY, soldier and President, was born in Charles City County, Virginia, in 1773, the son of Benjamin Harrison, one of the signers of the Declaration of Independence and a member of the Constitutional

Convention of 1787. He entered the army in 1791 and served in the Indian wars of that period, becoming distinguished by his defeat of the Indian tribes at Tippecanoe in 1811. As major-general in the regular army he won an important victory over the British at the battle of the Thames in 1813. He was elected to Congress in 1817 and to the Senate in 1824, was minister to Colombia in 1828, and in 1836 was the Whig candidate for President of the United States, but was defeated by Van Buren. He was nominated again in 1840 and on this occasion was elected by a very large majority. He did not live long to enjoy the honor, dying on April 4, 1841, just one month after his inauguration.

Harrison, a city of Hudson County, New Jersey, on the Passaic River, opposite Newark. It has numerous manufactures, and contains the State Soldiers' Home. Pop. 14,498.

Harrogate (har'ō-gāt), a town of England, county of York (West Riding), noted for its magnesia, sulphur, and chalybeate springs. The waters are especially recommended for patients with deranged digestive organs, chronic gout, and some cutaneous diseases. The sulphurous springs possess laxative and diuretic properties. The chalybeate are tonic. The bathing season lasts from May to September, and the number of annual visitors is about 40,000. Pop (1911) 33,706.

Harrow (har'rō), an agricultural implement, employed for smoothing land which has been plowed. It consists of a frame of woodwork, or of iron, in which are fixed rows of iron teeth.



Set of Iron Harrows.

There are several varieties of this implement, such as the 'brake' for breaking down rough land; the 'drill harrow' for pulverizing land before the deposition of seed, the 'grubber' for pulverizing between furrows of green crops.

Harrow-on-the-Hill (or simply HARROW), a town of England, county of Middlesex, on a hill of peculiar form. The grammar-school of Harrow, the rival of Eton, was founded in 1571 for the education of the poor children of the parish, certain fees being charged for strangers; but it is now almost entirely a school for the wealthy. The education originally given was exclusively classical, but mathematics, science, English history and literature, music, and drawing are now included among the subjects taught. Pop. (1911) 17,076.

Harry the Minstrel (or HENRY) commonly called *Blind Harry*, a wandering Scottish poet of the fifteenth century, to whom is attributed a poetical narrative of the achievements of Sir William Wallace. Its date may probably be placed between 1470 and 1490. It professes to be based on a history written in Latin by John Blair and Thomas Gray, which is now lost. It is often inaccurate, and has ceased to be much read.

Hart, ALBERT BUSHNELL, was born at Clarksville, Mercer county, Pa., 1854, and after being graduated from Harvard (1880), studied at Paris, Berlin, and Freiburg. He was instructor in history at Harvard (1883–87), assistant professor (1887–97), and has been professor since 1897. His works include *Introduction to the Study of Federal Government* (1890); *Foundations of American Foreign Policy* (1901); and he has edited *American History Told by Contemporaries*, and other historical works.

Hart, SOLOMON, an eminent historical painter, born at Plymouth, England, in 1806; died in 1881. He was elected Royal Academician in 1840. His works include *The Elevation of the Law* (in the Jewish worship), *Milton Visiting Galileo in Prison*, *Richard and Saladin*, etc.

Hart, a stag of five years of age. See *Stag*.

Harte, FRANCIS BRET, novelist and poet, was born at Albany, New York, in 1837. He went to California in 1854, and figured as a coal-dealer, a teacher, and a typesetter on the *Golden Era*, in which appeared some of his earliest literary efforts. He next became editor of the *Californian*, and in 1864 secretary to the United States Mint at San Francisco. In 1868 he became editor of the *Overland Monthly*, in which appeared, in 1869, the humorous poem of *The Heathen Chinee*. In 1878 he was appointed consul at Crefeld, whence he was transferred to Glasgow in 1880, and remained there until 1885. Among his best-known works are *The Luck of Roaring Camp; The Outcasts of Poker Flat; The Argonauts of '49; Two Men of Sandy Bar; Gabriel Conroy; Mrs. Skagg's Husbands; East and West Poems; In the Carquinez Woods; Maruja, a Novel*, etc. He died in 1902.

Hartford Convention, a convocation composed of representatives from the New England States, met at Hartford, Connecticut, in 1814, 'to confer on the subject of their public grievances.' The war of 1812 had been destructive to industry and wealth. The convention aroused suspicion and drew on its members bitter but unjust denunciation.

Hartford (hart-fẽrd), a city, the capital of Connecticut, on the Connecticut River, 60 miles above its mouth. It is pleasantly situated, is built with great regularity, and has among its edifices the state-house (built at a cost of $3,100,000), city hall, Hartford Theological Seminary, American School for the Deaf, Institute for the Blind, and Trinity College, St. Joseph's Cathedral, Wadsworth Athenæum, public libraries, the J. P. Morgan Memorial (in which many famous art treasures are kept). Both manufactures and trade are of large extent, the former embracing carpets, linen, silk, edge-tools, typewriters, electrical appliances, all kinds of machinery and machine tools, etc. Hartford is the seat of the Colt Firearms Company and a great center of the insurance business. The American asylum for the education and instruction of the deaf and dumb at Hartford was opened in 1817. Hartford was settled in 1635 by an English colony from Massachusetts. Pop. 121,502.

Hartford, a city, capital of Blackford County, Indiana, 45 miles s. by w. of Fort Wayne. It has large glassworks, pulp mills, etc. Pop. 6187.

Hartington (hàr'ting-ton), Spencer Compton Cavendish, Marquis of, was born in 1833, son of the seventh duke of Devonshire. He was educated at Trinity College, Cambridge, and in 1857 was elected one of the members for North Lancashire. In 1863 he became war secretary; in 1868 postmaster-general; in 1871 chief secretary for Ireland. He went out with the Gladstone ministry in 1874, and soon after he became the leader of the Liberal party. On the fall of the Conservative government in 1880 he became secretary for India, and was transferred to the war office in 1882. In the general election in 1885 he was returned to parliament. He strenuously opposed Gladstone's Home Rule Scheme of 1886. He succeeded to the title of Duke of Devonshire on the death of his father in 1891, became lord president of the council in 1895, and died in 1908.

Hartlepool (hàr'tl-pōl), a borough of England, including the municipal borough of Hartlepool and the town of West Hartlepool, in the county of Durham, 17 miles s.e. of the city of that name. The trade and industries of the towns are much of the same character; they possess ironworks, engine and boiler works, shipyards, etc. The two towns may be said to form one port. Pop. of Hartlepool 20,618, of West Hartlepool 63,932.

Hartmann (hàrt'mān), Karl Robert Eduard von, a German philosopher, born at Berlin, February 23, 1842; died near Berlin, June 5, 1906. With the publication of *Die Philosophie des Unbewussten* (Philosophy of the Unconscious), in which he substituted for Schopenhauer's world principle of will, the conception of the unconscious which contains within itself both will and intelligence, in 1869, he gained a conspicuous place among philosophic writers. Other of his works include *Phänomenologie des sittlichen Bewusstseins, Die Religion des Geistes, Die Weltanschauung der modernen Physik*, etc.

Hartmann von Aue (fon ou'e), a German poet, born about 1170; died about 1220. He wrote poetical tales, among which are *Ereo, Iwein*, both belonging to the Arthurian cycle of legends, and *Der Arme Heinrich*, upon which Longfellow based his *Golden Legend*.

Hartranft, John Frederick, soldier, born at New Hanover, Pennsylvania, in 1830; died in 1889. He studied law, entered the army in the Civil war and served till its close, gaining the rank of brevet major-general. He was chosen to execute the sentences of the military commission which tried Mrs. Surratt and others for the murder of President Lincoln. He was governor of Pennsylvania, 1872-78.

Hartshorn (hàrts'hōrn), in pharmacy, the horn of the common stag, from which substances deemed of high medical value were formerly prepared by distillation, such as spirits of hartshorn, oil of hartshorn, and salt of hartshorn. The active ingredient of these was ammonia, which is now obtained from gas-liquor and other sources.

Hart's-tongue (*Scolopendrium*), a genus of highly ornamental ferns. Their fronds are simple and undivided. There are about a dozen species known, the *S. vulgare* being found in England and the United States.

Harts. See *Hars.*

Harun al Rashid (hà-rön' al ra-shēd'), a celebrated caliph of the Saracens, 786-809.

(See *Caliph.*) The popular fame of this caliph is evinced by the *Arabian Nights' Entertainments*, in which Harun, his wife Zobeide, his vizier Giaffer, and his chief eunuch Mesrur are conspicuous characters.

Haruspices (har-us'pi-sēz). See *Aruspices.*

Harvard University (här'vard), the oldest university in the United States, situated in Cambridge, Massachusetts. The nucleus of it was formed in 1636 by the voting of a sum of £400 by the general court of Massachusetts. In 1638 the Rev. John Harvard bequeathed half of his property and his entire library to the projected institution. The college was immediately opened and received the name of its benefactor. The first graduation occurred in 1642. Its endowments have greatly increased since that time, and its invested funds now amount to about $24,000,000. The principal college buildings number twenty-five, and include several halls, such as University Hall, Harvard Hall, etc. The general library contains upwards of 850,000 volumes. There are more than 600 instructors, exclusive of assistants, and the number of students is about 4000. An entrance examination is required in one of two sets of subjects, of which classics predominate in the one, mathematics and science in the other. After the first year's course, which embraces a prescribed series of studies, the student has a large number of different courses to select from in order to qualify for the degree of Bachelor of Arts. The course of study extends to four years. Among the departments connected with the university are: 1. The Law School; 2. The Lawrence Scientific School; 3. The Divinity School; 4. The Medical, and 5. The Dental School, both situated in Boston; 6. The Bussey Institution of Agriculture; 7. The School of Mining. There may also be mentioned the Museum of Comparative Zoology (the Agassiz Museum), the Botanical Garden, and the Peabody Museum of American Archæology and Ethnology; also the Radcliffe College for women, established in 1894, in which women students can attain the full collegiate degrees. In the engineering and mining schools instruction is given in coöperation with the Massachusetts Institute of Technology, now located in a group of magnificent buildings at Cambridge.

Harvest-bug (*Leptus autumnalis*), a small larval insect of the family Acaridæ or mites. It is of a bright red color, so small as scarcely to be visible, and resembles a grain of cayenne pepper. It appears in June or July, and attacks the skin of domestic animals and human beings.

Harvest-fly, a name given in the United States to a species of cicada, which appears as a winged insect in the harvest season.

Harvest-moon, a name which denotes a peculiarity in the apparent motion of the full moon, by which in the United States and high latitudes generally it rises about the same time in the harvest season (or about the autumnal equinox in September) for several successive evenings. In southern latitudes this phenomenon occurs in March. It is owing to the fact that the moon is then traveling in that part of her orbit at which it makes the least possible angle with the ecliptic.

Harvest-mouse (*Mus messorius*), the smallest British quadruped, first made known to science by White of Selborne. It builds a globular nest usually suspended among stalks of wheat, etc.

Harvest-spider (*Phalangium longipes*), the Shepherd-spider abounding in autumn, possessing legs of unusual length. When irritated it has the peculiar property of throwing off one or more of its legs.

Harvey (här'vi), Sir George, an eminent Scotch painter, born in 1806; died in 1876. He was a native of St. Ninians, near Stirling, and in his eighteenth year entered the Trustees' Academy, Edinburgh. In 1826 he became an associate of the Royal Scottish Academy, and in 1829 an academician. He was highly successful in depicting scenes connected with the religious history of Scotland, such as *The Covenanters Preaching*, *The Battle of Drumclog*, *Quitting the Manse*, etc. He also excelled in depicting mountain scenery. In 1864 he was elected president of the Royal Scottish Academy, and was knighted in 1867.

Harvey, William, an English physician, the discoverer of the true theory of the circulation of the blood, was born at Folkestone in 1578; died in 1657. He entered Caius College, Cambridge, in 1593, and about 1599 proceeded to Padua, then the most celebrated school of medicine in Europe, and attended lectures on anatomy, surgery, and other branches of medical science. He took the degree of M. D., and returned to England in 1602. He settled in London, was admitted fellow of the College of Physicians, elected physician of St. Bartholomew's Hospital, and in 1615 was chosen Lumleian lecturer. His views on

the circulation of the blood were formally given to the world in his *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* ('On the Movement of the Heart and Blood in Animals'), published at Amsterdam in 1628, in which he claims to have expounded and demonstrated them for upwards of nine years. Harvey's theory was attacked by several foreign physicians; but from the commencement his views were widely received. In 1623 he was appointed physician extraordinary to James I, and in 1632 he became physician in ordinary to Charles I. He was present at the battle of Edgehill, and afterwards accompanied Charles to Oxford. Here he received the degree of M.D., and was elected Master of Merton College, an office which he lost on the surrender of Oxford to the Parliament. He returned to London in 1646, and spent the remainder of his life in retirement.

Harvey, a city of Cook county, Illinois, a suburb of Chicago. It has manufactures of machinery, stoves, railroad supplies, etc. Pop. 7227.

Harveyized Steel, a term applied to armor-plate steel which has been surface hardened by a process invented by H. A. Harvey. In this process an all-steel plate is laid in a bed of finely powdered clay or sand, and the upper surface covered with carbonaceous material, which is pressed down upon it. Over the carbon is placed a layer of sand covered in with fire brick. Heat is then applied of a sufficient intensity to melt iron. The heat and pressure are kept up for several days until the face of the steel has absorbed enough carbon to harden it. An additional amount is usually about one per cent. The carbonaceous material is then removed and the plate chilled in running water.

Harwich (hăr'ich), a seaport of England, County Essex, 66 m. E. N. E. of London. The harbor is spacious, and has been much improved by the construction of two breakwaters. Steam packets ply regularly to continental ports. Ship-building and other maritime employments are carried on, and cement is dredged up outside the harbor. Harwich is much frequented by sea-bathers. Pop. (1911) 13,623.

Harwood, Andrew Allen (1802-1884), an American naval officer, born at Settle, Pa. During the Civil War he was chief of the Bureau of Ordnance, commanded the Potomac flotilla and was secretary of the Lighthouse Board. He was promoted to rear admiral in 1870.

Harz, or Hartz (härts), the *Hercynia Silva* of the Romans, the most northerly mountain chain of Germany, from which an extensive plain stretches to the North Sea and the Baltic. It extends from southeast to northwest, and comprises an extent of about 60 miles in length and nearly 20 in breadth, embracing the towns of Klausthal, Goslar, Blankenburg, Wernigerode, etc. The Brocken, its highest summit, is 3742 feet high. (See *Brocken.*) That part of the Harz which includes the Brocken, with the neighboring high summits, is called the Upper Harz, and consists entirely of granite. The northeast portion is called the Lower Harz. The Harz abounds in woods and fine pastures; and is rich in minerals, including silver, iron, lead, copper, zinc, arsenic, manganese, granite, porphyry, slate, marble, alabaster, etc.

Hasdrubal (has'dru-bal; more correctly *Asdrubal*, 'Baal is his help'), the name of several Carthaginian leaders, particularly the brother of Hannibal, the hero of the Second Punic war. On the departure of Hannibal for Italy, B.C. 218, he was left in command of the army in Spain, in which capacity he carried on a long series of military operations against the Roman troops, which were commanded by Cnæus and Publius Scipio. His brother Hannibal requiring his assistance in Italy, Hasdrubal led an army from Spain into that country (B.C. 207), but before he could join forces with his brother he was defeated on the right bank of the Metaurus by C. Nero and M. Livius. Nero is said to have thrown Hasdrubal's head into Hannibal's camp, as a brutal announcement to him of the defeat and death of his brother.

Hashish (hash'ĕsh), an intoxicating preparation made in Eastern countries from common hemp (*Cannabis sativa*), or rather from the Indian variety of it (*Cannabis Indica*); also a name for this plant itself or for its tender shoots. The juice of the plant has powerful narcotic properties, and is variously made use of. A resin which the plant gives out is often gathered and kneaded and formed into small balls called *churrus*, and from this a narcotic is prepared. It has the appearance of a tenacious ointment of a greenish-yellow color, with an acrid savor and a nauseous smell. Hashish produces a kind of intoxication, accompanied with ecstasies and hallucinations. When dried and smoked as tobacco the plant is called *bhang;* or this name is given to a drink prepared from the leaves and shoots. *Ganja* or *Gunja* is the dried shoots of the female plant with the resin on them. Hashish in several forms is employed in medicine.

Haslar Hospital. See *Gosport*.

Haslingden (has'ling-den), a town of England, county of Lancaster, 16 miles north of Manchester, with manufactures of cottons, woolens, etc. Pop. (1911) 18,723.

Hasselt (has'selt), a town of Belgium, capital of the province of Limburg. It has tobacco factories and gin distilleries. Pop. 16,170.

Hastings (has'tings), a city of Nebraska, capital of Adams County, 97 miles w. of Lincoln. It has lumber, harness, cigars, and other manufactures and ships livestock and grain. Here is the State Asylum for the Chronic Insane. Pop. 11,241.

Hastings (hās'tings), a town of England, county of Sussex, one of the Cinque Ports, pleasantly situated on the seacoast, and including the suburb of St. Leonards-on-Sea. In front of the town is an esplanade, a fine pier 900 feet long, and baths said to contain the largest tepid swimming-bath in the world. There is no harbor. Fishing and boat-building are carried on, but the principal support of the town is derived from the numerous visitors who frequent it during the bathing and winter seasons. There are here the ruins of an ancient castle, and of the church and conventual buildings of a college, supposed to have been founded in the reign of Henry I. William of Normandy defeated Harold near here, 14th October, 1066. Pop. (1911) 61,014.

Hastings, Francis Rawdon, Marquis of, Governor-general of India, born in 1754; died in 1825. He entered the army and from 1776 to 1782 served with distinction in the American war. In 1793 he became Earl of Moira, and in 1795 commanded the expedition to Quiberon. From 1813 to 1823 he was governor-general of India, and was successful in the Nepaulese and Mahratta wars. In his later years he was governor of Malta.

Hastings, Thomas, American architect, born in New York 1860, was educated in Paris and graduated from the Ecole des Beaux-Arts in that city in 1884. He entered partnership with John M. Carrere and remained in the firm of Carrere and Hastings, from 1884 designers of many notable buildings in the United States. The firm were architects of the Ponce de Leon and Alcazar hotels at St. Augustine, Fla., the New York Public Library, the Central Congregational Church at Providence, R. I., the New Theatre, later the Century, New York; the Senate Office at Washington, D. C. Thomas Hastings was elected a member of the National Academy in 1903 and became a Chevalier of the Legion of Honor, France.

Hastings, Thomas (1787-1872), an American hymn-writer and choir leader. His hymnals include *The Christian Psalmist, The Mother's Hymn-Book, Devotional Hymns and Poets*, etc.

Hastings, Warren, first governor-general of India, was born at Daylesford, in Worcestershire, in 1723; and died there in 1818. He was grandson of the rector of Daylesford. He was educated at Westminster School, and in 1750 he set out for Bengal in the capacity of a writer in the service of the East India Company. When stationed at Cossimbazar he was taken prisoner by Surajah Dowlah on the capture of the place (1756). Having made his escape, he served as a volunteer under Clive in 1757. He was representative of the Company at Moorshedabad from 1758 to 1761. In the latter year he removed to Calcutta, having obtained a seat in the Bengal Council, but returned to England in 1764. As he lost the bulk of his means by unfortunate Indian investments, he again entered the Company's service, and sailed for India in 1769. In consequence of the misgovernment of the Nabob of Bengal the Company had deprived him of all real power, and now wished to have the country more directly under their control. Warren Hastings was its chief instrument in this undertaking, and in 1772 became president of the Supreme Council of Calcutta. Mohammed Reza Khan, the administrator of the revenues of Bengal, was now accused by an unprincipled character named Nuncomar of corruption and abuses of power. In this prosecution Hastings acted as the tool of the Company. Mohammed and Shitab Roy, dewan of Behar (who had been similarly accused), were afterwards honorably acquitted, but meantime the reorganization desired by the Company had been carried out. In 1773 the Company's powers were considerably modified by an act of Parliament, and Hastings now received the title of Governor-general of India. As the majority of the Council disapproved of Hastings' past policy, Nuncomar, his old ally, took advantage of the circumstance to accuse him of peculation (1776). The accusations were favorably received by the Council, when Nuncomar was suddenly accused by a Calcutta merchant (acting probably on the instigation of Hastings) of forgery, tried, and executed. In 1776 the directors of the Company petitioned the government for his removal from the Council,

but Hastings resigned, and a successor to him was appointed. In 1777 one of the members of the Council died, and Hastings, having thus procured a casting vote, withdrew his resignation, and returned to office. He now displayed extraordinary resource in meeting dangerous movements on the part of the Mahrattas, the Nizam of the Deccan, and Hyder Ali of Mysore, and to procure the needful money was less than scrupulous in his treatment of the rulers of Benares and Oude. He thus gave good grounds for censure, and a motion for his recall was passed in the House of Commons. Fox's India Bill was thrown out in 1783, but next year Pitt's bill, establishing the board of control, passed, and Hastings resigned. He left India in 1785, and was impeached by Burke in 1786, being charged with acts of injustice and oppression, with maladministration, receiving of bribes, etc. This celebrated trial, in which Burke, Fox, and Sheridan thundered against him, began in 1788, and terminated in 1795 with his acquittal, but cost him his fortune. The Company in 1796 settled on him an annuity of £4000 a year, and lent him £50,000 for eighteen years free of interest. He passed the remainder of his life in retirement in Daylesford, which he purchased.

Hat, an outdoor covering for the head, of various shapes and materials (as felt, silk, wool, straw), but having a *brim* as its most distinctive and general feature. Hats are of ancient origin. Among the Greeks, for instance, the *petasos* was worn, which had a brim, and was similar to the round felt now worn. The shape of the hat has varied extremely in Europe at different periods. The *dress hat* or *silk hat* with a smooth nap outside is an important form of this article, though felt hats are in more general wear. (See *Felt.*) The silk hat was invented at Florence about 1760. The manufacture, however, did not make much progress till 1828. Up to and even after this time beaver fur was the chief material for hats. A silk hat is composed of a skeleton, to which the silk plush is glued. The skeleton, consisting of three parts, the cylindrical part or body, the crown, and the brim, is usually made of linen, covered with gum-lac, and to the cylindrical part the crown is gummed. The cylindrical part is made by gumming together the edges of a piece of cloth shaped on a cylinder. The brim is composed of superposed layers of stiffer cloth, and made with a flat projecting surface round its inner edge, which is gummed to the skeleton. For covering the hat a sort of hood of silk plush is made, cut across in an oblique line. This cover is drawn over the skeleton on the block, and fitted exactly to it by the application of a hot iron. The heat of the iron melts the gum-lac, which on cooling cements the covering to the skeleton. The edges

Forms of Hats in 16th, 17th, and 18th Centuries.

1, 2, time of Henry VIII. 3, time of Mary. 4, time of Elizabeth. 5, 6, time of James and Charles I. 7, 8, time of Commonwealth. 9, 10, time of William III. 11-16, Eighteenth Century.

of the oblique cut are also coated with gum-lac. The hat is finally shaped on the block or form, and the plush damped and polished, while the hat revolves on a turning lathe. In the manufacture of straw hats the straw commonly used is that of wheat or barley. The best comes from Italy, and particularly from Tuscany, but straw hats are also largely made in England. Palm-leaf hats are imported from China and Manila, and are also machine-made in the United States.

Hatching, natural and artificial. See *Incubation.*

Hatchment (hatch'ment; corrupted from *achievement*), in heraldry, the coat of arms of a person dead, usually placed on the front of a house, in a church, or on a hearse at funerals, by which the fact of the death and the rank of the deceased may be

known; the whole being distinguished in such a manner as to indicate whether the person was a bachelor, married, etc.

Hatchway (hatch'wā), a square or oblong opening in the deck of a ship, affording a passage from one deck to another, or into the hold. The *after-hatchway* is placed near the stern, the *fore-hatchway* towards the bows, and the *main-hatchway* near the mainmast.

Hathaway, ANNE, wife of Shakespeare, born in 1556; died in 1623.

Hatfield (hat'fēld), a town of England, in Hertfordshire, 19 miles N. N. W. of London. Pop. 8502.

Hathor. See *Athor*.

Hatras (hä'trus), a town of India, Northwest Provinces, Aligarh District, formerly one of the strongest fortresses in India, now a commercial center. Pop. 42,578.

Hatteras, CAPE, at the extremity of a low sandbank, North Carolina, with lighthouse 190 ft. high. It is separated from the mainland by Pamlico Sound. Violent storms occur, and the coast is dangerous.

Hattiesburg, a city, county seat of Forrest County, Mississippi, in a fertile farming country. It has box factories, cabinet works, canning factories, etc., and is the seat of a state normal college and the Mississipi Woman's College, etc. Pop. 11,733.

Hatto (hat'to), the name of two archbishops of Mainz, of which the second, who died in 969 or 970, is the best known. He was Abbot of Fulda, 942–968, when he was appointed Archbishop of Mainz. Of his subsequent life very opposite accounts exist: some represent him as an upright prelate and reformer of abuses; others in the blackest colors. The legend of his being devoured by rats, which Southey has popularized, is well known.

Hatton (hat'on), SIR CHRISTOPHER, Lord-chancellor of England, a favorite of Queen Elizabeth, born about 1540; died in 1591. He was one of the commissioners for the trial of Mary, queen of Scots, in 1586.

Hatzfeld (hätz'felt), a town of the Austrian Empire, in Hungary, district of Torontal. Pop. 10,152.

Hauberk (hä'bėrk), a kind of coat of mail, comprising the small and the large hauberk, the former consisting of a jacket in scales descending to the hips, with loose sleeves not reaching to the elbow; the latter with a *camail* or hood, reached to the knee, the sleeves extending a little below the elbow.

Hauff (houf), WILHELM, a German novelist and writer of humorous and fantastic stories, born 1802; died 1827. His first publication was his *Almanach of Tales* for the year 1826. *Lichtenstein*, a novel written under the inspiration of Sir Walter Scott, appeared in 1826, and is one of the best German novels of its class. Among the most popular of his works are two novelettes, *The Picture of the Emperor* and *The Beggar-woman of the Pont-des-Arts*.

Haupt (houpt), LEWIS MUNLENBERG, engineer, was born at Gettysburg, Pennsylvania, in 1844. He graduated at West Point, entered the engineer corps of the army, but resigned in 1869 and became professor of civil engineering in the University of Pennsylvania. After 1892 he served in the Nicaragua and Panama Canal Commissions, was chief engineer of the survey for a ship canal across New Jersey, and served in other enterprises. He wrote *Working Drawings*, *The Topographer*, *A Move for Better Roads*, etc.

Haupt, PAUL, orientalist, was born at Görlitz, Germany, in 1858. In 1883 he became professor of Semitic languages in Johns Hopkins University. His works include *The Cuneiform Account of the Deluge*, *The Akkadean Language*, *Jonah's Whale*, *The Book of Esther*, etc., and editor of *The Polychrome Bible*, and *New Critical Edition of Hebrew Text of the Old Testament*.

Hauptmann (houpt'-mān), GERHART, a German poet, dramatist and novelist, was born in Silesia in 1862 and received the Nobel prize for his novel, *Atlantis*, on his fiftieth birthday. Among his best-known plays are *Vor Sonnenaufgang* (*Before Sunrise*), 1889; *Die Weber* (*The Weavers*), 1892; *Die Versunkene Glocke* (*The Sunken Bell*), 1896; *Rose Bernd*, 1903.

Hauran (hä-ō-rän'), a district in Syria, east of the Jordan and south of Damascus. It contains the ruins of many ancient towns, with numerous Greek inscriptions. In the Roman period it was one of the four provinces of Bashan. It is a very fertile territory, but thinly populated at the present time.

Haussa (hous'sa). See *Houssa*.

Haustellata (hąs-tel-la'ta), a very extensive division of insects, in which the mouth is furnished with a haustellum or proboscis adapted for suction. It includes the butterflies and moths, two-winged flies, etc., these insects being contrasted with the Mandi-

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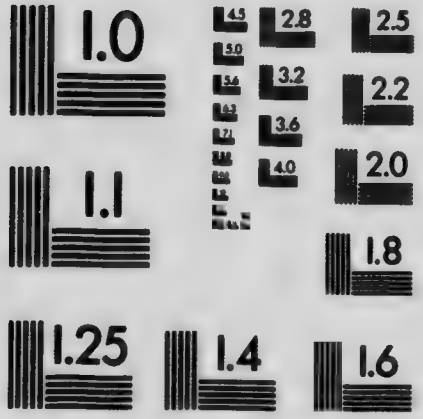

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bulata, which have jaws acting as cutting organs.

Hautboy (ō'boi). See *Oboe*.

Hautelisse Tapestry (ōt'lis), a kind of tapestry wrought with a perpendicular warp, as distinguished from *Basselisse*.

Hautes-Alpes. See *Alpes*.

Hautes-Pyrénées. See *Pyrénées*.

Haüy (à-ü-ē), René Just, a French mineralogist, born in 1743; died in 1822. He studied theology, became an abbé, and during twenty-one years occupied the place of a professor, at first in the college of Navarre, and afterwards in that of the Cardinal Le Moine. He studied botany, and subsequently mineralogy, and introduced a once celebrated system of crystallography. On the outbreak of the revolution Haüy was imprisoned for refusing to subscribe to the new constitution, but his life was saved by the exertions of Geoffroi de St. Hilaire. In 1793 he was appointed a member of the Commission of Measures and Weights, in 1794 conservator of the Cabinet des Mines, and in 1795 teacher of physics in the Ecole Normale. In 1802 Napoleon made him professor of mineralogy in the Musée d'Histoire Naturelle, and also shortly after in the Faculté des Sciences. Haüy was remarkable for the extreme modesty of his disposition. His principal writings are his *Essai sur la Théorie et la Structure des Cristaux* (1784), his *Traité de Minéralogie* (1802), his *Traité élémentaire de Physique* (1803), and his *Traité de Cristallographie* (second edition, 1822), etc.—His brother Valentin, born 1745, died 1822, started the first institution for the instruction of the blind. See *Blind (The)*.

Havana (ha-van'a; Spanish, *La Habana*, 'the haven'), an important maritime city, capital of Cuba, on the northwest side of the island, with an extensive and excellent natural harbor. The town in the older parts has narrow, badly-paved streets, but there are also wide and handsome promenades and avenues. The houses, which are low and with flat roofs, resemble those of Southern Spain. Havana is the see of a bishop, and was the seat of the governor. The cathedral formerly contained the ashes of Columbus, which were brought hither from San Domingo in 1796. Among the other buildings are the governor's house, the admiralty, the university, the exchange, the opera house, etc. The staple manufacture is that of its celebrated cigars. The other manufactures, consisting chiefly of chocolate, straw hats, and woolen fabrics, are not of much consequence. The trade is extensive, the most important articles of export being sugar and tobacco, unmanufactured or in the form of cigars and cigarettes; other exports are molasses, coffee, wax, honey, rum. The United States have the principal share of the trade, and Spain and England rank next. The town was founded in 1511, but was only fairly begun in 1519. In 1762 it was taken by the British, who restored it to Spain in the following year. It was blockaded by the American fleet during the war with Spain. January 1, 1899, the United States military authorities took formal possession of the city, and relinquished it in 1902. Pop. (1913) 324,200.

Havel (hä'vel), a navigable river of Germany, which rises in Mecklenburg-Schwerin, enters Prussia, flows past Spandau, where it receives the Spree, and joins the Elbe, after a course of 160 miles.

Havelberg (hä'vel-burg), a town in Prussia, province of Brandenburg, on the Havel, engaged in brewing, sugar-refining, and shipbuilding. Pop. 6649.

Havelock (hav'lok), Sir Henry, major-general in the British army, was born at Bishop-Wearmouth, near Sunderland, in 1795. Having entered the army, he served with distinction in the Burmese war (1824-26). In 1829 he married a daughter of Marshman, the celebrated missionary, became a Baptist, and

was distinguished during the remainder of his life by his earnest religious zeal. He attained his captaincy in 1838, participated in the Afghan war, was present at the storming of Ghasni and the capture of Cabul, and in Sale's march to Jelalabad, and assisted in the defense of that city, and in the defeat of Mohammed Akbar, 1843. He was made a Companion of the Bath, and brevet-major, took part in the Mahratta war, and distinguished himself in the Sikh war of 1845. In 1851 he was promoted to the adjutant-generalship of the queen's forces in India. On the outbreak of the Indian mutiny he was despatched to Allahabad to support Sir H. Lawrence at Lucknow and Sir H. Wheeler at Cawnpore. After several victories he arrived at Cawnpore and found that Nana Sahib had massacred the prisoners. Pursuing his march to Lucknow, he defeated the Rebels at Bithoor, and finally, with the aid of Outram, won the battle of Alumbagh. Having captured Lucknow, Havelock and Outram were shut up there until relieved by Sir Colin Campbell, 17th November, 1857. He died just seven days later. He was raised to the rank of major-general and made a baronet.

Haven (hā'ven), JOSEPH (1816-74), an American theologian, born at Dennis, Massachusetts, educated at Amherst College, and studied for the ministry at Union Theological Seminary, New York. He was pastor of Congregational churches at Ashland and Brookline, Massachusetts, for a time, and later became professor of systematic theology at Chicago Theological Seminary, 1858-70.

Haverfield (hāv'er-feld), FRANCIS (1860-), an English educator and historian, born at Shipston-on-Stour, educated at New College, Oxford. He was Rhind lecturer at Edinburgh, 1905-06; Creighton lecturer at London University, 1910; a governor of Westminster school, 1900-08; first president of the Society for the Promotion of Roman Studies, 1910-16. Among his publications are: The Romanization of Roman Britain, Ancient Town-Planning, Military Aspects of Roman Wales, etc.

Haverford College an institution of learning, situated at Haverford, Pennsylvania, 9 miles W. N. W. of Philadelphia. It is under the control of the Society of Friends.

Haverfordwest (hav'er-förd, hār'förd), a town of Wales, county town of Pembroke, and one of the Pembroke district of parliamentary boroughs, on the West Cleddaw River. It manufactures paper, and has a small shipping trade. Pop. (1911) 5920.

Havergal, FRANCIS RIDLEY, a popular hymn writer, was born at Astley, Worcestershire, England, 1836; died, 1879. Her writings in poetry and prose have been extremely popular with the religious public and some of her hymns have found their way into church collections. Her collected *Poetical Works* appeared in 1884.

Haverhill (hā'vėr-il), a city of Essex County, Massachusetts, on the Merrimac, 33 miles N. of Boston. It has extensive manufactures of boots and shoes, employing nearly 15,000 hands, and also produces box boards, hats, caps, flannels, and bricks. The river is navigable to this town. The poet Whittier was born here in 1807. Pop. (1910) 44,115.

Haverstraw (hav'er-strą), a village of Rockland County, New York, 35 miles N. of New York City. It has extensive manufactures of bricks and brick machines, and has dyeworks and print mills. Pop. 5669.

Havildar (hāv-il-dar'), the highest non-commissioned officer in the native armies of India, in rank equivalent to a sergeant. Also a police official in villages.

Havre (ä-vr), LE (formerly *Le Havre-de-Grâce*), a seaport of Northern France, dep. Seine-Inférieure, on the north side of the estuary of the Seine, 108 miles northwest of Paris, built of brick or stone in straight, wide streets. The public buildings possess little interest. The manufactures include chemicals, machinery, cotton goods, earthen and stone ware, paper, glass, oil, refined sugar, ropes, etc. A government tobacco factory employs 300 workmen; and a great number of vessels are built. But the chief dependence of Havre is on its commerce, which is the greatest of any French port next to Marseilles. It has a large trade with England and Germany, and especially with America, importing great quantities of cotton and other produce; and exporting numerous articles of French manufacture. The importance of Havre dates from the early part of the sixteenth century. Pop. (1906) 132,430.

Hawaii (hä-wī'ē), or HAWAIIAN ISLANDS, formerly the SANDWICH ISLANDS, a cluster of islands in the North Pacific, thirteen in number, with a total area estimated at 6000 to 7000 square miles. Five of these islands are barren islets, and only four are of considerable size. They are generally of volcanic origin and mountainous in charac-

ter, with numerous lofty peaks. The highest of these, Mauna Kea, on the island of Hawaii, is 13,805 feet high, and Mauna Loa (an active volcano on the same island) is 13,675 feet. On the eastern slope of the latter is the famous volcano Kilauea, 4400 feet in elevation, but with an enormous crater and a living lake of fire, which at times overflows in tremendous eruptions. Haleakala on Maui Island, is 10,030 feet high and has a crater 2000 to 3000 feet deep and from 25 to 30 miles in diameter. It is, however, inactive. The surface of the islands in general is rugged, though with many fertile valleys; the coasts high and precipitous, with few good harbors. Of the habitable islands, Hawaii (which now gives its name to the group) is much the largest, its area being 4015 square miles. The second largest, Maui, of 728 square miles area, consists of two peninsulas, connected by a low isthmus. The most important island is Oahu, of only 600 square miles in area, yet the most populous and containing the city of Honolulu, the capital and chief port of the island group. Next in size is Kauai, of 544 square miles. The remaining habitable islands are much smaller, Molokai, of 261 square miles, being peopled by a colony of lepers, sent there from the other islands. The native Hawaiians are of the light-colored oceanic Malay stock, and have become civilized and converted to Christianity. There are extensive forests, and fruits grow profusely, including banana, mango, guava, plantain, and others. Coffee is a semi-wild plant, and taso yields an important food product. Of cultivated plants, the sugar cane is by far the most important, the great bulk of the population being engaged in its culture, and Hawaii ranking third in cane sugar production. Coffee and rice are also raised, the chief exports being sugar, rice, coffee, bananas, tallow, and hides. The natives of the islands have greatly decreased in numbers, being now much surpassed by the introduced population, consisting of Japanese, Chinese, Portuguese, and comparatively few other Europeans and Americans. Honolulu has grown into a city of considerable importance, having a splendid harbor, and concentrating nearly the whole trade of the islands.

These islands were discovered by Captain Cook in 1778, the discoverer losing his life here. Each island had formerly its own king, but under Kamehameha I (who died in 1819) they were combined into one kingdom. It was a simple despotism until 1840, when Kamehameha III granted a constitutional government. At a later date Queen Liluokalani sought to restore the despotism and in 1893 a revolution broke out, headed by American settlers, and the queen was deposed and a provisional government formed under the presidency of Sanford B. Dole. It was made a republic in the following year. The islands were offered to the United States, but not accepted until August, 1898, when the warship *Philadelphia* was sent to take possession. In June, 1900, the group was organized under a territorial government, and given the title of Hawaii Territory. Pop. 191,909.

Hawarden (har'den), a town in Flintshire, Wales, lying in a coal district, and having valuable clay beds in the vicinity. In the neighborhood is Hawarden Castle, residence of the late William E. Gladstone. Pop. 20,575.

Hawes (haus), STEPHEN, an English poet, who lived in the end of the fifteenth and beginning of the sixteenth century. The exact date of his birth and death is unknown. His principal work is *The Historie of Graunde Amour and la Bell Pucell, or The Pastime of Pleasure.*

Hawfinch (ha'finch; *Coccothraustes vulgaris*), a species of grossbeak, so called from the belief that it subsisted principally on the fruit of the hawthorn. It is one of the largest of the finches. It resembles the chaffinch in color, but is distinguished from it by its enormous beak, larger size, and bill-hook formation of some of its wing-feathers. Among American species of grossbeak are evening grossbeak and pine grossbeak.

Hawick (ha'ik), a parliamentary burgh of Scotland, in Roxburghshire, on the Teviot, 50 miles s. w. from Edinburgh. The staple industries of the town are the manufacture of hosiery and tweeds, but tanning, skin-dressing, oil-making, dyeing, and iron-founding are also carried on. Pop. 17,303.

Hawk (hak), a name often applied to all birds of prey except the eagles, vultures, and owls. It thus includes the falcons as well as the hawks proper, the latter being distinguished from the former chiefly by their shorter wings, which do not reach the extremity of the tail, and have the fourth quill longest and the first short; their beaks also are less robust, and want the tooth-like notch of the former. None is bolder and more pertinacious in pursuit of its prey than the sparrow-hawk (which see); see also *Falcon.*

Hawke (hak), EDWARD, LORD, a celebrated English naval commander, born in 1705; died in 1781. He entered the navy as a midshipman, in 1734 received the command of the *Wolf*, and

in 1747 became commander of a squadron, and defeated the French fleet at Belleisle. Hawke was in consequence made a K. C. B., and vice-admiral of the blue. In 1759 he defeated the French at Quiberon. Hawke was, in 1765, appointed vice-admiral of Britain, and was elevated to the peerage in 1776.

Hawker (hąk'er), ROBERT STEPHEN, an English poet and divine, was born in 1805, and died in 1875. He was educated at Oxford and became vicar of Morwenstow, Cornwall. His works comprise *Ecclesia, Cornish Ballads; Echoes from Old Cornwall; The Quest of the Sangreal*; etc.

Hawkers and Peddlers, traveling vendors of small wares.

Hawke's Bay, a district of New Zealand, on the east coast of North Island; area, 3,050,000 acres, containing much fertile soil, well adapted for agricultural and pastoral purposes. The capital is Napier. Pop. 8775.

Hawkesbury, a river in New South Wales, flowing into the Pacific near Sydney, and remarkable for its inundations.

Hawking. See *Falconry*.

Hawkins (hąk'ins), SIR ANTHONY HOPE, author, widely known as 'Anthony Hope,' was born in London, 1864, studied law, but gave up his practice in 1894 and wrote many novels. He was knighted in 1918. Author of *Man of Mark, Mr. Witt's Widow, Dolly Dialogues, Prisoner of Zenda, The Indiscretion of the Duchess, The Heart of the Princess Osra, Phroso*, etc.

Hawkins, SIR JOHN, an English sea commander, born at Plymouth, in 1520. He made several voyages in his youth in the slave trade and was defeated by the Spaniards in 1567. He was appointed vice-admiral and knighted for his services against the Spanish Armada, and in 1595 sailed, in company with Drake, against th Spanish colonies in the West Indies, but was unsuccessful. He died the same year.

Hawk-moth, one of the sphinx moths, so called from its hovering motion, which resembles that of a hawk looking for its prey. The death's-head hawk-moth is the *Acherontia atropos*; the privet hawk-moth, the *Sphinx ligustri*; the humming-bird hawk-moth, the *Macroglossa stellatarum*.

Privet Hawk-moth.

Hawkweed, or *Hieracium*, a genus of composite plants, characterized by yellow, orange or red flowers, with imbricated involucre, furrowed and toothed fruit, and bristly pappus. In America, the native species of *Hieracium* are generally known as rattlesnake-weeds, but *H. aurantiacum*, which is supposed to be naturalized from Europe, is known as the orange hawkweed.

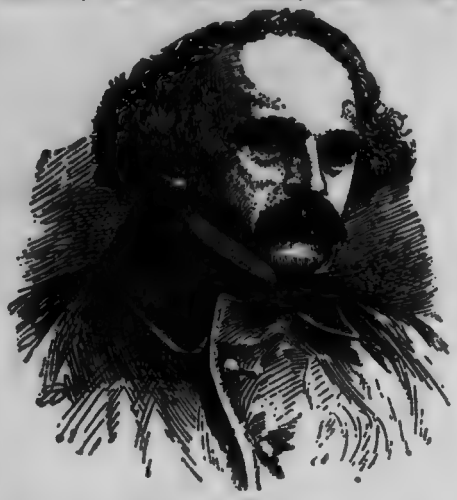
Hawley (hą'lē), JOSEPH ROSWELL, statesman, was born at Stewartsville, North Carolina, in 1826. He studied law, and became prominent as a Republican writer and speaker. He served during the Civil war, and was mustered out as brevet major-general. In 1866 he was chosen governor of Connecticut, and in 1868 president of the Republican National Convention meeting at Chicago; was member of Congress, 1872-76, and in 1873-76 president of the United States Centennial Commission, in which he was largely instrumental in furthering the international exhibition at Philadelphia. In 1881-1905 he was United States senator. Died in 1905.

Hawser (hą'sėr), in ships, a small cable or a large rope, in size between a cable and a tow-line, used in warping, etc.

Hawthorn (hą'thorn), or WHITETHORN (*Crataegus Oxyacantha*), a small spiny European tree, belonging to the sub-order Pomeæ of the order Rosaceæ, rising sometimes to the height of 20 to 25 feet. The leaves are alternate, obovate, 3 to 5 lobed; the flowers are white, sometimes with a reddish tinge, disposed in corymbs, and possess an agreeable perfume; the fruit is a drupe of a red color, and is edible. The species are about fifty in number, all shrubs or small trees. A number of them belong to the United States. When young the hawthorn springs up rapidly, and if pruned grows into a thick hedge. When it arrives at the height of a tree, however, it makes wood very slowly. The timber is hard and durable, and fit for many purposes of utility. The double-flower kind is one of the most ornamental for shrubberies. Hawthorn blossom is often called *May*, from the time of its flowering in England.

Hawthorne, NATHANIEL, a novelist of remarkable originality, born at Salem, Massachusetts, in 1804; died in 1864. He studied at Bowdoin College, where he took his degree in 1825 along with the poet Longfellow. For a number of years after this he led a retired and studious life in Salem, writing tales, some of which appeared in newspapers and magazines. In 1837 appeared

his *Twice-told Tales*, a collection of stories which he had contributed to various American periodicals. In 1838 he was appointed a weigher in the Boston custom-house, a post which he held for a few years. In 1846 he published his *Mosses from an Old Manse;* in 1850 *The Scarlet Letter;* in 1851 *The House of the Seven Gables;* and in 1852 *The Life of President Pierce*, and the *Blithedale Romance*. In 1853 he became American consul at Liverpool, a post which he held until 1857. He died at Plymouth, New Hampshire. Other works are his *Transformation* (1860), *Our Old Home* (1863), etc.—JULIAN, son of the above, born in 1846;



Nathaniel Hawthorne

also a novelist. He wrote *Bressant, Idolatry. The Subterranean Brotherhood*, etc.

Hay (hā), the stems and leaves of grasses and other plants cut for fodder, dried in the sun, and stored usually in stacks. The time more suitable for mowing grass intended for hay is that in which the saccharine matter is most abundant in the plants, viz. when the grass is in full flower. For the operation of mowing, dry weather, and, if possible, that in which sunshine prevails, is chosen. The making of the grass into hay generally takes three or four days to get it ready for stacking. This period is principally occupied in alternately *tedding* (*i. e.* shaking out the grass loosely) and gathering it up into cocks or small heaps, previous to stacking. Care must be taken to avoid haymaking either under a scorching sun or during the prevalence of rain, and the cocks should never be opened in the morning until the disappearance of the dew. In stacking the great object is to preserve the freshness of the herbage, and to induce a slight degree of fermentation. If the weather has been wet a few layers of straw may be inserted at intervals. Salting is also recommended. On large farms the tedding is performed by a tedding or haymaking machine.

Hay, JOHN, American statesman and author, born at Salem, Indiana, October 8, 1838; died at Newburgh, New Hampshire, July 1, 1905. He graduated from Brown University in 1858, studied law in the office of Abraham Lincoln, was admitted to the bar in 1861, and soon after became Lincoln's private secretary, serving until his death. He was secretary of the U. S. Legation at Paris, 1865–67, at Vienna, 1867–69, and at Madrid, 1869–70. After his return he was for five years an editorial writer on the New York *Tribune;* and 1879–81 first assistant secretary of state. In 1897 Hay was appointed by President McKinley ambassador to Great Britain, but was recalled in 1898 to become secretary of state, succeeding W. R. Day, who was sent to Paris as a member of the Peace Conference. This office he held until his death. He directed the peace negotiations with Spain after the war of 1898, influenced the Powers to declare publicly for the 'open door' in China, urged the 'administrative entity' of China, and took the initiative in inducing Russia and Japan to 'localise and limit' the area of hostilities. With Lord Pauncefote he secured the abrogation of the Clayton-Bulwer Treaty and the conclusion of a new treaty with Great Britain (1901), by which Great Britain withdrew her objections to a canal constructed by the United States across the Isthmus of Panama, under the guarantee of neutralization by the latter Power. He also negotiated treaties with Colombia and with Panama, looking toward the conclusion of the canal; arranged the settlement with Germany regarding Samoa, and that by just commission concerning the disputed Alaska boundary in 1903. He published *Pike County Ballads* (1871), *The Breadwinners* (1883), etc., and with John G. Nicolay *Abraham Lincoln: A History* (10 vols. 1894).

Hayden, FERDINAND VANDEVEER, an American geologist, born in Westfield, Mass., 1829; graduated at Oberlin in 1850; engaged in the Civil War as surgeon of volunteers, and was breveted lieutenant-colonel; spent many years in exploring the Rocky Mountains and adjacent country. He edited the first eight reports (1867–1876) of the United States geographical and geological surveys and wrote several works on exploration in the West. He died in 1887

Haydn (hī'dn), JOSEPH, a celebrated Austrian musical composer, born at Rohrau, on the borders of Hungary and Austria, 1732; died 1809. At the age of six he was sent to school at Haimburg, where he learned, among other things, singing and playing by rote. On account of the excellence of his voice he was appointed a choir-boy at St. Stephen's Church, Vienna. At the age of sixteen his voice began to break, and he lost his situation as chorister. Having made the acquaintance of Metastasio, Porpora, and Gluck, Hadyn gradually attracted attention by the brilliancy of his compositions; the *Creation* being his masterpiece.

Haydon (hā'dun), BENJAMIN ROBERT, an English historical painter, born in 1786; died by his own hand in 1846. In 1804 he became a student of the Royal Academy, and in 1807 exhibited his first work, *Joseph and Mary Reposing* (in Egypt), and his *Dentatus* in 1809. His *Judgment of Solomon* appeared in 1814. In 1815 he established a school in opposition to the Academy, an undertaking which ended in pecuniary failure in 1823. He was the chief English historical painter of his time.

Hayes, CHARLES WILLARD, Dr. C. Willard Hayes, for many years Chief Geologist of the United States Geological Survey, died in Washington, D. C., February 10, 1916. He was born in 1859.

Hayes, (hāz), ISAAC ISRAEL, Arctic explorer, born in Chester County, Pennsylvania, in 1832; died in 1881. He was a member of the expedition of 1853–55 under Dr. Kane, and himself commanded an expedition in 1860–61. He served as an army doctor during the war, and in 1869 he visited Greenland. He wrote *The Open Polar Sea*, and *The Hand of Desolation*.

Hayes (hāz), RUTHERFORD BIRCHARD, President, was born at Delaware, Ohio, in 1822. He was a successful practitioner of the law until in 1861, at the outbreak of the Civil war, he was made major of volunteers. His conduct on the field was marked by conspicuous gallantry, and he attained by meritorious service the rank of brevet major-general. In 1865 he was elected a member of Congress, where he won the reputation of a good working member. In 1867, 1869, and 1875 he was elected governor of Ohio. In 1876 he was nominated for the Presidency against Samuel J. Tilden, the Democratic candidate. The election proved so close that the result was in doubt, both parties claiming a victory. An Electoral Commission, appointed by Congress, was required to decide the result of the election, which declared in favor of Mr. Hayes. His administration was conciliatory towards the South, and earnest in its efforts for the reform of the civil service. After his retirement he was actively interested in education and prison reform. He died in 1893.

Hay Fever, or HAY ASTHMA, a complaint characterized by the symptoms of common catarrh; swelling of the nasal mucous membrane, copious watery discharge and paroxysms of sneezing. The exciting cause is attributed to various substances, such as pollen of certain flowers, dust, etc.

Haymarket Square Riot, an occurrence at Chicago on May 4, 1886, when a bomb was thrown by some unidentified person during an anarchist meeting on Randolph Street. Seven policemen, who had been endeavoring to disperse the mob, were killed, and 27 others wounded. The bomb thrower was never arrested, but four men were hanged as accomplices and several others were imprisoned.

Haynau (hī'nou), JULIUS JAKOB, an Austrian general, born in 1786; died in 1853. He took part in the battles of Austerlitz and Wagram.

Hayne (hān), ISAAC, a Revolutionary martyr, born in South Carolina in 1745. Taken prisoner at the capture of Charleston, he was paroled to visit his sick family. Required to join the British, he fled to the American camp, and was made colonel, but was soon captured and hanged.

Hayne, PAUL HAMILTON, American poet, born at Charleston, S. C., 1830. Called the Laureate of the South; died 1886.

Hayne, ROBERT YOUNG, American statesman, born 1791. He served in the war against England in 1812, and in 1823 became United States Senator from South Carolina. He opposed Daniel Webster in debate over Foote's resolution. Died 1839.

Hay-Pauncefote Treaty. See *Hay*.

Hayti (hā'tī), HAITI, or SAN DOMINGO (originally *Española*; Latin, *Hispaniola*), one of the West Indies, southeast from Cuba, and separated from it by the Windward Passage, 50 miles broad. Its length is 400, and breadth 150 miles; area, about 28,000 square miles. It is of irregular form, intersected west to east by three chains of mountains. The central chain contains the highest peak, Loma Tina, 10,200 feet. The principal plain is the fertile Vega Real. The rivers are numerous, but of small size. The minerals include gold, silver,

quicksilver, etc., but are greatly neglected. Hayti as a whole is one of the healthiest of the West Indian Islands. The seasons are: a wet, during which heavy rains are most frequent in May and June; and a dry, during which little or no rain falls. The flora includes pines, mahogany trees, fustic, satin-wood, lignum vitæ, and other cabinet and dye woods, plantains, bananas, yams, batatas, oranges, pineapples, etc. The staple cultivated products are: coffee, sugar, indigo, cotton, tobacco, and cacao. The fauna includes the agouti, European cattle and pigs run wild, snakes, caymans, turtles, etc. Among the principal towns in Hayti are Port-au-Prince, San Domingo, Jacmel, and Cape Haytien.

Hayti was discovered by Columbus in 1492. It was then inhabited by perhaps 2,000,000 natives, but so ruthlessly did the Spaniards deal with the aborigines that within a century they practically exterminated them, having introduced negro slaves in their place. In 1630 the French settled in the western part of the island, and in 1697 the western portion was ceded to them, while the eastern remained Spanish. In 1791 the negroes revolted against France, and latterly the whole island came under the negro leader Toussaint L'Ouverture, who established an independent republic. He was captured, but in 1803 Dessalines headed a new insurrection, drove out the French, and was crowned emperor of Hayti. He was assassinated in 1806, and the Spaniards regained the eastern portion of the island. In 1821 the Spanish portion declared itself independent of the mother country, and assumed the name of Spanish Hayti; but it was subjugated by Boyer, the President of the Haytian Republic, or French Hayti. In 1844 the inhabitants of the Spanish portion rose, and formed themselves into a republic under the name of San Domingo (Republica Dominica). In 1861 Santana negotiated a reunion of the state with Spain, but Spain evacuated the island in 1865. From that period its history presents a long record of revolution and bloodshed, of which the gunpowder explosion that killed President Leconte in 1912, is typical. It now comprises the Republic of Hayti on the west side of the island, and the Dominican Republic on the east. Port au Prince is the capital of Hayti, which has an area of 10,204 sq. miles and population of 2,000,000. San Domingo is the capital of the Dominican Republic, which has 18,045 sq. miles area and about 700,000 population. The people are in great part negroes and mulattoes. A murderous outbreak in 1915 led to a ten days' reign of terror and United States intervention, that country taking control of the custom house and finances for ten years, and establishing a native constabulary force under the command of an American officer.

Hazard (haz'ard), a game at dice played for money. The player is called the *caster*, and his opponent, who bets with him, is called the *setter*. The former calls a *main*, i. e. any number from 5 to 9 inclusive. He then throws with two dice, and wins if he 'nicks.' Five is a nick to 5; 6 and 12 are nicks to 6; 7 and 11 to 7, etc. The caster loses or 'throws out' if he throws aces, or deuce ace (called *crabs*). Hazard is a game involving nice calculations.

Hazaribagh (he-zär-i-bäg'), chief town of the district of the same name, in Chota Nagpur, Bengal. Pop. 15,306. The district contains 7021 square miles. Pop. 1,104,742.

Hazebrouck (äz-brųk), a town of France, dep. Nord, having a fine church with an open spire 240 feet high. It has linen manufactures, breweries, tanneries, dye-works, etc. Pop. 9194.

Hazel (hā'zel; *Corylus*), a genus of shrubs or small trees of the order Corylaceæ or Cupuliferæ. It belongs to Europe, North Africa, Asia, and North America. The leaves are roundish-cordate, alternate, and shortly petiolate. The European hazel (*C. Avellana*) produces the nuts called filberts, and grows best in a tolerably dry soil. It bears male and female flowers, the former composing cylindrical catkins. The hazel-nut oil is little inferior in flavor to that of almonds. Hazel branches form excellent walking-sticks, fishing-rods, etc., and the wood produces good charcoal, often employed by painters. The American hazel (*C. americana*) very much resembles the European. The roots are used by cabinet-makers for veneering; and in Italy the chips are sometimes put into turbid wine for the purpose of fining it.

Hazel-grouse (*Bonasa betulina*), a species of grouse inhabiting the continent of Europe and great part of Asia, allied to the ruffed grouse of America.

Hazeline (hā'zel-in), an alcoholic liquid distilled from the fresh leaves of the *Hamamelis Virginica*, the witch-hazel, native to the United States. It is exceedingly useful as an application to wounds, stanching the bleeding and promoting healing. It is equally useful for bruises, inflammatory swellings, sprains, and the like. It is applied on a pledget of lint to bleeding piles. In internal bleeding, whether from the lungs, stomach, or bowels, it gives very satisfac-

tory results. There are several officinal preparations of the witch-hazel, a fluid extract and a tincture, the dose of the former being 15 to 60 drops, and of the latter 2 to 5. Hazeline is the name given to a clear colorless liquid prepared by certain chemists, but not officinal.

Hazleton (hāz'el-ton), a city of Luzerne County, Pennsylvania, 22 miles s. of Wilkes-Barre, on the Lehigh Valley and Pennsylvania railroads. It is in the anthracite coal region, surrounded by collieries and other industries affiliated with mining. It has iron, steel and pump works; also numerous textile establishments, such as silk, knitting, underwear and shirt factories. An excellent state hospital is located here. A local corporation manufactures electricity from culm (waste from coal mines) and sells electric power cheaply. Pop. 30,147.

Hazlitt (haz'lit), WILLIAM, English critic and essayist, son of a Unitarian minister, was born at Maidstone in 1778; died in 1830. In 1793 he became a student in the Unitarian College, Hackney, but on leaving it devoted his time to portrait painting. This was in its turn renounced for literature, his first publication being an essay *On the Principles of Human Action*, 1805. He delivered various series of lectures, and contributed to the *Edinburgh Review*, etc. Among his chief works are: *Characters of Shakespeare's Plays*, *A View of the English Stage*, *Lectures on the English poets*, *Lectures on the English Comic Writers*, *Table Talk*, *Lectures on the Elizabethan Age*, *Life of Napoleon Bonaparte*, and *Round Table* essays, written with Leigh Hunt.—WILLIAM CAREW, born in 1834, grandson of the above, became an author and editor, among his publications being *History of the Venetian Republic*, *Memoirs of William Hazlitt*, etc.

Head (hed), the term applied to the anterior part of the body of an animal when marked off by a difference in size, or by a constriction (neck). A gradual increase of complexity in the structure of the head is observable as we ascend from the lowest to the highest forms of life. In the Protozoa, Infusoria, and Cœlenterates nothing that can be regarded as a head is found, and it is not till we ascend to the worms proper, the articulated animals (crustaceans, myriapods, spiders, and insects), the land and freshwater gasteropods (snails and whelks), and the cuttle-fishes, that a head proper is found. The cuttle-fishes have a remarkable cartilaginous box, which, like a skull, protects their anterior nervous ganglia, and gives support to the muscles. The head of the vertebrated animals presents a regular series of increasing complexity from the lancelet upwards, and as the anterior nervous mass enlarges, and its ganglia increase in complexity, so do the anterior vertebræ change their character; as the brain becomes specialized, so does the brain-case or skull, attaining its highest development in man. In man, and in the higher vertebrates, the head consists of an upper chamber, lodging the brain, the eyes, and other sense organs, and a lower, lodging the first portion of the alimentary canal. In proportion as the vertebrates become developed, the brain increases in size, and its position advances anteriorly, until, in man, it comes to overhang the face. The head is the seat of intelligence and of consciousness, as it contains the brain and the organs of sense, touch being the only sense not limited to it. See *Skull*.

Head, SIR FRANCIS BOND, miscellaneous writer, brother of the following, born 1793; died 1875. He was present at the battle of Waterloo, being in the royal engineers; in 1825 undertook the working of gold and silver mines in Rio de la Plata; in 1835 became governor of Upper Canada, and in 1838 suppressed the Canadian insurrection, and was made a baronet. He was the author of *Bubbles from the Brunnen of Nassau*, *Rough Notes of Rapid Journeys across the Pampas*, *A Faggot of French Sticks*, *The Horse and his Rider*, etc.

Head, SIR GEORGE, a writer of travels, etc., born in 1782; died in 1855. He held various posts in the army, and was present at most of the great battles of the Peninsula. In 1814 he proceeded to Canada to be chief of the commissariat of a proposed navy on the Canadian lakes, and subsequently published his experiences in *Forest Scenes and Incidents in the Wilds of North America*. He was knighted in 1831. He also wrote *Rome, A Tour of Many Days*, translations of Pacca's *Memoirs*, and of Apuleius, with other works.

Headache (*Cephalalgia*), arises from a variety of causes. The principal forms it assumes are:—(1) *Congestive Headache*, arising from overfulness of blood. It may be cured by purgatives, while reduction of the diet and saline medicines are beneficial. (2) *Anæmic Headache*, which arises from a deficiency of blood, and occurs in persons badly fed or in weak girls. Good food and iron tonic, with application of cold to the head, are often of service in such cases. (3) *Nervous Headache*, which often attacks the studious, and which is relieved by nerve tonics, and especially by phosphorus pills. (4) *Neuralgic Head-*

ache, which is often due to exposure to cold. What is called *Hemicrania* or *Megrim*, which is the limitation of the headache to one-half or less of the head, is often treated with bromide of potassium. In cases in which headache arises from disease of the liver, nausea results, and this characterizes *bilious* headache. Impurity of blood and gouty affections, as well as disease of the kidneys, are frequent sources of headache.

Head Hunters, a title given to several tribes, including the Dyaks of Borneo, the Kyans of Celebes, the natives of Formosa, etc., on account of their savage mania of hunting for human heads, chiefly by nocturnal raids, and treasuring them as trophies. The practice resembles the scalp-taking of the American Indians.

Headley, JOEL TYLER, historian, was born in Delaware county, New York, in 1814; was graduated at Union College in 1839. In 1855 he was elected secretary of state for New York. He was the author of numerous works of history and biography, including *Napoleon and his Marshals* (1846), *Oliver Cromwell* (1848), *The Second War Between England and the United States* (1853), *Life of Washington* (1854), and *The Great Rebellion* (1863-66). He died in 1897.—His brother, PHINEAS CAMP (1819-1901), a Presbyterian minister, wrote *Women of the Bible*, *Public Men of To-day*, Lives of Josephine, Kossuth, Grant, etc., and many other works.

Healds. See *Heddles*.

Health (helth) is that condition of the living body in which all the bodily functions are performed easily and perfectly, and unattended with pain. The most perfect state of health is generally connected with a certain condition of the bodily organs, and well marked by certain external signs. See *Sanitary Science*.

Health, BILL OF. See *Bill*.

Health, MUNICIPAL BOARDS OF, in the United States, are institutions organized under city government, and deriving powers from state laws for the purpose of protecting the health of the citizens. Every city of importance has a municipal board of health.—STATE BOARDS OF, institutions established by state legislative enactments, intended to have a central advisory relation with local sanitary organizations, and to superintend a state system of vital statistics. They have been created in most of the states, and in the District of Columbia, with ever-widening activities.

Hearing. See *Ear* and *Acoustics*.

Hearn, LAFCADIO, author, born in the Ionian Islands in 1850, resided for many years in New Orleans and New York, and later in Japan. His *Two Years in the French West Indies* is an example of poetical prose that attracted much attention. He wrote also *Glimpses of Unfamiliar Japan*, and other works. He died in 1904.

Hearne (hêrn), THOMAS, an English antiquary, born in 1678; died in 1735. Hearne studied at Oxford, and was in 1701 appointed assistant keeper of the Bodleian Library, and he held the post of second librarian from 1712 to 1715, but had to resign as his Jacobite principles precluded him from taking the oaths to the government. Among his works may be mentioned *Ductor Historicus*, *Reliquiæ Bodlicianæ*, *History and Antiquities of Glastonbury*, editions of Leland, of Spelman's *Life of Alfred*, Fordun's *Scotichronicon*, etc.

Hearst, PHEBE, philanthropist, born in 1842, her maiden name being Apperson. In 1861, she was married to George F. Hearst, late United States Senator from California, who died in 1891. He left her very wealthy, and she donated from $3,000,000 to $4,000,000 to the University of California for buildings, having previously paid the cost of a competition of the best architects of Europe and America for the plans. She also gave $200,000 to the American University, Washington, D. C., to build a National Cathedral School for girls, and considerable sums for other educational and charitable work.

Hearst, WILLIAM RANDOLPH, son of the preceding, born in San Francisco, California, in 1863. He became a journalist in early life, and was editor and proprietor of the *San Francisco Examiner* in 1886. In 1895 he bought the *New York Journal*, and later bought the *Advertiser* and renamed it the *American*, and started the *Chicago American* and *Morning Examiner*, the *Boston American*, and the *Los Angeles Examiner*. He engaged actively in politics, made himself prominent by his radical newspaper methods, was elected to Congress in 1903 and 1905, and was a candidate for the Democratic Presidential nomination in 1904. He ran for mayor of New York City in 1905, for governor of New York State in 1906, and for mayor again in 1909.

Heart (hart), a hollow muscular organ, the function of which is to maintain the circulation of the blood, the organs of circulation being the heart.

the arteries, the veins, and the capillary vessels. The heart in men, quadrupeds, birds, and some reptiles is composed of four cavities, two *auricles* and two *ventricles*. It is enveloped in a membrane called the *pericardium*, and is situated toward the left of the cavity of the chest, between the lungs. With each beat the apex of the heart strikes against the wall of the chest in the space between the fifth and sixth ribs, a little below and to the right of the left nipple. The right auricle communicates with the right ventricle, besides which there are in it three openings, that of the *vena cava inferior*, that of the *vena cava superior*, and that of the *coronary vein*. The communication between this auricle and ventricle is closed by a valve when the ventricle contracts. The right ventricle communicates with the pulmonary artery, the opening into the artery being guarded by a valve formed of three flaps. When these are brought together they interrupt the communication between the ventricle and the artery. The left auricle communicates through a valved opening with the left ventricle, and contains the orifices of the four pulmonary veins. The left ventricle, besides the communication with the left auricle, contains the orifice of the aorta, also provided with a valve similar to that of the pulmonary artery. The auricle and ventricle of one side are separated from those of the other by a complete muscular partition, the *septum cordis*. The valves at the openings of the arteries are called *semilunar*, that at the orifice of the right auricle *tricuspid*, that at the orifice of the left auricle *mitral*, and that at the orifice of the vena cava inferior the *Eustachian* valve. The heart is formed of a firm thick muscular tissue, composed of fibers interlacing so as to form a figure of eight. It also contains nerves and vessels. The arteries carry the blood from the heart to all parts of the body. They terminate in the capillary vessels, a series of extremely minute tubes which pass over into the veins. The veins are the channels by which the blood passes back from the body to the right auricle of the heart. The blood which is returned from the veins is purplish red, from excess of carbonic acid gas and deficiency in oxygen, and is called *venous;* that which leaves the heart is bright red, being oxygenated, and is called *arterial*. The venous blood parts with its excess of carbonic acid and receives new supplies of oxygen in the capillary system of the lungs, flows into the pulmonary veins, thence into the left cavities of the heart, thence it passes into the aorta, and is transmitted to all parts of the body, returning to the veins by the capillary system. It is now become venous, passes through the veins from the extremities towards the heart, receiving the chyle and the lymph, and is emptied into the right cavities of that organ, which returns it through the pulmonary artery to the capillary vessels of the lungs, where it is subjected to the influence of the air, resumes the qualities of red or arterial blood, and is ready for a new course.

HUMAN HEART.

Fig. 1, Exterior. A, Right auricle. B, Left auricle. C, Right ventricle. D, Left ventricle. E, Vena cava superior. F, Aorta. G, Pulmonary artery. H, Brachiocephalic trunk. I, Left primitive carotid artery. K, Left subclavian artery. L, Left coronary artery.

Fig. 2, Section, right side. C, D, E, F, G as in Fig. 1. a, Cavity of right auricle. b, Inferior vena cava. c, Coronary valve. d, Entrance of the auriculo-ventricular opening. e, Valve of the pulmonary artery. f, Fossa ovalis.

The mechanism of the circulation is as follows:—The blood contained in the two venæ cavæ is poured into the right auricle, which contracts, and thus forces the fluid to escape; but the venæ cavæ oppose to its backward passage the column of blood which they contain, and it must therefore pass into the right ventricle. The ventricle then contracts, and the tricuspid valve closing the passage through which the liquid entered, it is forced into the pulmonary artery, along which it must flow (return to the ventricle being prevented by the semilunar valve) into the capillary system of the lungs, whence it passes into the pulmonary veins, which pour it into the left auricle by four orifices. The contraction of the auricle impels it into the left ventricle, by which it is driven forward into the aorta (the mitral valve preventing its return into the auricle), and thence into the general circulation. The two auricles contract and relax simultaneously with each other, as do also the two ventricles. The relaxation is called *diastole;* the contraction *systole*. The quantity of blood projected at each systole is generally estimated at six ounces. The causes of the alternate contraction and relaxation are

entirely involuntary and dependent on the nervous system to a large extent. The systole of the ventricles is the cause of the motion of the blood in the arteries, which dilate with each wave driven into them.

The heart is the seat of various and generally dangerous diseases. One of these is *pericarditis* or inflammation of the pericardium, the double lining membrane or bag enveloping the heart. The cause of this disease may be exposure to cold, or an injury, or it may be complicated with other diseases. Inflammation of the inner lining is termed *endocarditis*. *Valvular* disease is a common affection of the heart, the valves becoming thickened, contracted, rigid, or otherwise affected, so that they cannot properly perform their duty. The mitral valve, for instance, may become too narrow and contracted, and the result is that all the blood does not pass into the aorta. In other cases of valvular disease, the same result follows, viz. imperfect depletion of the ventricles and auricles, the return of blood being termed *regurgitation*. The heart consequently becomes weakened, while the entire system suffers. *Overgrowth* or *hypertrophy* and *dilatation* are frequent results of valvular disease. In such cases the avoidance of violent exercises and emotions is necessary. The use of *digitalis* is often successful in strengthening and soothing the heart. Certain diseases produce atrophy, in which the heart becomes feeble in action, while *fatty degeneration* occurs when the muscular fibers are replaced by oleaginous particles. This renders the heart peculiarly liable to rupture under any strain or violent emotion, hence such should be carefully avoided by patients. Among other organic diseases of the heart are *angina pectoris* (the cause of which is uncertain), distinguished by a sense of strangling or suffocation in the breast. *Neuralgia* of the heart is similar in symptoms to angina. A very common heart ailment is *palpitation*, often caused by indigestion, and the excessive use of tea and tobacco. *Syncope* or *fainting* results from the sudden cessation or slowing of the heart's action, and may be caused by excitement, emotion, or shock of some kind. Some of the above forms of heart disease can be discovered only by auscultation or percussion; others are very evident even to non-professional observers.

Heart's-ease. See *Violet*.

Heart-urchin. the name applied to certain genera of sea-urchins on account of their cordate or heart shape.

Heat (hēt), the name given to a peculiar sensation, and also to the agent which produces it, this being now believed to be a certain motion in the minute molecules of which all bodies are composed.

One of the most obvious effects of heat is to alter the *temperature* of bodies. In almost all cases when heat is supplied to a body, the temperature of the body rises, and when heat is removed the temperature of the body falls. If the increase of temperature is evident, and such as may be noted by the thermometer, the heat is then termed *sensible;* if not, as in the case of ice immediately melted, it is termed *latent*. Temperature is, in fact, the tendency that a body has to impart heat to other bodies. If two bodies impart no heat to each other when in contact, they are said to have the same temperature. When the one possesses more heat than the other there is an impartation of heat from the former until the temperature is equalised. Different bodies require very different amounts of heat in order to raise their temperature through the same number of degrees. Thus it requires about thirty times as much heat to raise the temperature of 1 lb. of water 1° as to raise the temperature of 1 lb. of mercury by the same amount. The terms *capacity for heat* and *specific heat* are used in relation to this property of bodies. The capacity for heat of a body is the quantity of heat required to raise its temperature 1° from some fixed point, as from 0° C., or from 32° Fah. The specific heat of a substance is the ratio between the quantity of heat required to raise the temperature of the substance 1° from some fixed point and the quantity of heat required to raise the temperature of an equal mass of distilled water 1° from 0° C.

Heat changes the *dimensions* of bodies. Increase of volume is the normal effect, although the reverse is observed in water between 0° C. and 4° C., and in iron and bismuth. Between moderate limits bodies expand nearly regularly with the temperature, but this does not hold good of the more extreme limits. (See *Expansion*.) Addition of heat *liquefies solid bodies*, and converts *liquids into gases*. During the conversion of a solid into a liquid, or a liquid into a gas, a considerable quantity of heat is absorbed, and in the reverse process heat is given out; but this is one of the cases in which, though heat is taken in or given out, the temperature is not altered. Hence the heat is said to be made *latent*. Heat also alters the power of bodies for *conducting electricity*. In solids the conductivity is diminished

to a great extent by an increase of a few degrees in the temperature. In liquids, on the other hand, increase of temperature increases the conductivity. The magnetic properties of bodies are also changed by heat. For example, an iron bar that has been magnetised suddenly loses the whole of its magnetism at a particular temperature. Heat possesses the power of altering the *chemical properties* of bodies. In some cases it breaks up chemical compounds, but in general it favors chemical combination.

In measuring quantities of heat various units may be adopted, as, for instance, the quantity necessary to melt a pound of ice. But the unit quantity of heat now generally fixed on (the Centigrade thermometer and metrical system being employed) is the quantity of heat which will raise the temperature of 1 gramme of distilled water from 0° C. to 1° C.; or 1 lb. of water may be used instead of 1 gramme, and one degree Fahrenheit instead of one degree Centigrade. *Calorimetry* is the technical name given to the part of the subject that deals with the practical measurement of quantities of heat.

When heat is applied to one end of a bar of iron it is propagated through the substance of the bar, producing a rise of temperature which is first perceptible at near, and afterwards at remote portions. This transmission of heat is called *conductivity*. The best *conductors* are metals, but all bodies conduct more or less. The best conductor is silver, next follow in order of their conductivity copper, gold, brass, zinc, tin, steel, iron, lead. With the exception of mercury and other melted metals, liquids are exceedingly bad conductors of heat. This can be shown by heating the upper part of a column of liquid and observing the variations of temperature below. These will be found to be scarcely perceptible and to be very slowly produced. If the heat were applied below we should have the process called the *convection of heat;* the lower layers of liquid would rise to the surface, and be replaced by others which would rise in their turn, thus producing a circulation and a general heating of the liquid. When the heat is applied above the expanded layers remain in their place, and the rest of the liquid can be heated by conduction and radiation only.

Radiation of heat consists in the propagation of heat from a hotter body to a colder one through an intervening medium which is not heated during the process. The heat is transmitted by the same medium that transmits light from a luminous body. Radiant heat and light are, in fact, the same thing, namely, vibrations of an elastic medium, the luminiferous ether, supposed to fill all space, and they obey the same laws of reflection, refraction, interference, and polarisation. They also obey the general laws of wave-motion. A luminous body excites in the ether waves or undulations of a great many different wave-lengths, some of them capable of affecting the eye as light, and others not. Heat rays need not be at all luminous; they may have no light-giving power, but may be what are known as rays of *dark heat*, capable of being detected by the thermometer, but not perceptible to the eye. Other rays are purely *chemical* in their effect (as in photography), and are called *actinic* rays. The general effect of radiation is to equalise the temperature of any system of bodies so placed as to be capable of radiating one to the other. Every body of the system is constantly sending forth heat rays in all directions, and receiving the heat radiated from the other bodies. But the hotter bodies emit more than they receive, while the colder bodies receive more than they emit, and the temperature of the system is thus gradually equalised. The rapidity or otherwise of radiation differs much in different bodies. The radiation depends on the nature of the surface of the body, and the power of a body to radiate heat is intimately connected with its power of absorbing heat radiated to it, and with its power of reflecting heat. Surfaces that are good radiators are good absorbers, and surfaces that absorb heat readily reflect it badly. Thus, a kettle covered with soot loses, when filled with hot water, heat more rapidly than one with a brightly polished surface. The best absorber of all is a surface covered with a thin coating of lampblack. Brightly polished metals are the worst absorbers among the bodies that are not transparent to radiant heat.

The transmission of radiant heat through various substances is a subject of great importance. In this connection the terms *diathermanous* and *athermanous* correspond to *transparent* and *opaque* in the case of light. One of the chief diathermanous bodies is rock-salt. Common white glass transmits rays of high refrangibility, stopping those of low refrangibility. Hence its use as a fire screen. For the greater part of the heat of a common fire is of the dark kind, and is nearly all stopped by the glass; but glass does not screen from the heat of the sun, a great part of which consists of heat of high refrangibility. On the other hand, smoked rock-salt transmits very little of the heat of high refrangibility, though it

is almost perfectly diathermanous to dark heat.

The nature of heat was long a subject of active controversy. The common theory during the last century, and in the early part of the present, was the *materialistic*, or that by which heat was regarded as an imponderable fluid (*caloric*) which could permeate all matter, and which, uniting with the particles of bodies, produced the phenomena associated with heat. The materialistic theory was held by Black and Lavoisier, but it was exploded by the experiments of Rumford and Davy. Among the contributions of Davy to the science was his celebrated experiment of rubbing together two pieces of ice, while surrounded by an ice-cold atmosphere, until they melted away completely. He concluded that 'the immediate cause of the phenomenon of heat is motion, and the laws of its communication are precisely the same as the laws of the communication of motion.' Between 1840 and 1843 Joule conclusively established the truth of this theory —the *dynamical theory* of heat—by measuring the amount of energy required to produce a definite heating effect, and by showing that the quantity of heat obtained by expending a definite amount of energy in friction is the same whatever is the nature of the body in which the friction takes place. The conclusions arrived at by him are thus given:—

1st. The quantity of heat produced by the friction of bodies, whether solid or liquid, is always proportional to the quantity of work expended.

2d. The quantity of heat capable of increasing the temperature of 1 lb. of water by 1° Fah. requires for its evolution the expenditure of mechanical energy represented by the fall of 772 lbs. through 1 foot. This amount of energy or work, equal to 772 *foot-pounds*, is called the *dynamical equivalent of heat*.

That heat is a form of energy is now considered by all to be beyond question. Every substance is considered to have some kind of molecular structure, and heat is regarded as consisting in the relative motions of the molecules or particles. The greater the energy of the motion the higher the temperature of the body, so long as it maintains its original state, solid, liquid, or gaseous; and an alteration in the nature of the motion probably constitutes the change from one of the states of matter to another. After the time of Rumford and Davy, Fourier and Carnot were highly distinguished for their inquiries into the mathematical theory of heat. Fourier investigated the theory of conduction and radiation, while on the investigations of Carnot has been founded the branch of Thermo-dynamics, which treats of the conversion of heat into mechanical force or energy, and *vice versâ*. (See *Thermo-dynamics*.) The investigations of Joule and the discovery of the quantitative equivalence of energy with heat, led to the enunciation of the theory of the *conservation of energy*. See *Energy*.

Heat-engine. See *Thermo-dynamic Engine*.

Heath (hēth), the common name of many plants of the nat. order Ericaceæ. Those that belong to the genus *Erica* have their leaves simple and entire; their flowers oval, cylindrical, or even swelled at the base; the corolla is four-cleft; the stamens eight, terminated by anthers which are usually notched or bi-aristate at the summit, and the fruit dry, four or eight-celled. From 400 to 500 species are known, twelve or fifteen of which inhabit Europe, and have small flowers, whilst all the remainder are natives of South Africa (the vicinity of the Cape of Good Hope). Many of them bear brilliantly colored flowers.

Heathfield (hēth'fēld), George Augustus Elliot, Lord, a British general, born in Roxburghshire in 1718; died in 1790. He studied at the University of Leyden, and at the French military school at La Fère, and served for some time in the Prussian army. He entered the British army in 1735, was wounded at Dettingen in 1743, and in 1762 took part in the capture of Havana. In 1775 he became commander-in-chief of the forces in Ireland, and soon after governor of Gibraltar. Spain and France having sided with America against Britain, Gibraltar was besieged by the two former powers, and successfully defended by Elliot from 1779 to 1783, the siege and defence being among the most memorable in history. The king sent Elliot the order of the Bath, and shortly after he returned to England, and was created Baron Heathfield in 1787.

Heat Spectrum, the part of the spectrum from an incandescent body that contains invisible heat rays. To produce the heat spectrum properly lenses and prisms of rock-salt must be employed. When the spectrum from the sun is examined it is found that the maximum heat intensity is in the darkheat spectrum at a considerable distance from the place where light ceases to be perceptible.

Heaven (hev'n; probably signifying that which is *heaved* up or elevated), in a physical sense, the azure vault which spreads above us like a bol-

low hemisphere, and appears to rest on the earth at the horizon. It is in reality merely the appearance presented to us by the immeasurable space in which the heavenly bodies move. According to some its azure color is due to the light of the celestial bodies reflected from the earth to the air, and thence back again. According to others the reflection is not from the air, but from its contained vapors. A theory recently broached assigns the azure color to the presence of particles of dust in the air. In theology, this word denotes a region of the universe where God's presence is especially manifested, in contrast with the earth. According to the Hebrew scriptures heaven consisted of three regions:—(1) That of the clouds, or air; (2) that of the stars; and (3) the abode of God. They also divide it into two parts, 'The Heaven' and the 'Heaven of Heavens.' Among the Greeks the gods were supposed to reside on Olympus, and the classic poets placed the abode of the just in the Elysian fields. The heaven of Islam is a scene of sensuous enjoyment, while that of the Buddhist consists in *Nirvana*, regarded by some as meaning the absorption of individual existence in the great ocean of being. The ancient German had his Walhalla, and the American Indian has his happy hunting grounds. Among Christians the general opinion is that heaven is the residence of the Most High, the holy angels, and the spirits of just men made perfect, that this abode is eternal, and its joys intensely spiritual.

Heavy Spar.

See *Baryta*.

Hebe (hē'bē), in Greek mythology, the goddess of youth, and the cupbearer to the gods, until replaced by Ganymede, a daughter of Zeus and Hera, who gave her as a wife to Heracles. In the arts she is represented with the cup in which she presents the nectar, with the figure of a charming young girl, her dress adorned with roses, and wearing a wreath of flowers.

Hebe, by Canova.

Heber (he'bĕr), Reginald, an English poet and bishop, was born in 1783; died in 1826. In 1800 he entered Brasenose College, Oxford, and in 1803 wrote his celebrated prize poem of *Palestine*. After traveling on the continent he became, in 1807, rector of Hodnet, and having married Amelia, daughter of the dean of St. Asaph, was appointed prebend of the cathedral. On the death of Bishop Middleton, Heber was consecrated Bishop of Calcutta in 1823; but he had only occupied the position for about two years when he died of apoplexy at Trichinopoli, in 1826. In addition to his hymns, the best known productions are *Palestine*; an edition of the works of Jeremy Taylor (with *Life*); *Poems and Translations*.

Hébert (ā-bār), Jacques René, notorious during the French revolution, was born at Alençon in 1757; was executed in 1794. Hébert first attracted notice as editor of the violent Jacobin organ *Le Père Duchesne*. In 1792 he became a member of the municipality of Paris, which contributed to the massacres of September, and he was named attorney-general under the commune. In 1793 the Girondists procured his arrest, but he was released by the convention. He was one of those who established the worship of reason, and he was always on the side of bloody measures. Having denounced Danton, the latter, in conjunction with Robespierre, secured his arrest and decapitation with the guillotine in 1794.

Hebrew Language and Literature

(hē'brō), the language and literature of the Jews, Israelites, or Hebrews, especially at that period when they formed a compact nation inhabiting Canaan or Palestine. (For a sketch of the history of the people see *Jews*.) The Hebrew language forms a branch of the Semitic family of languages, being akin to the Aramaic (Chaldee and Syriac), Arabic, Ethiopic, and Assyrian. In the antiquity of its extant literary remains Hebrew far surpasses the other Semitic idioms, and in richness and development is only inferior to the Arabic. The language is deficient in grammatical technicalities, especially in moods and tenses of the verb, in the absence of the neuter gender, etc. Its roots are triliteral (consisting of three consonants), and words are derived from them by the reduplication of the letters of the root, and by the addition of formative elements before and after the roots. The alphabet is composed of twenty-two consonants, the vowels being expressed by marks above or below these letters. The accents and marks of punctuation amount to about forty. The writing is from right to left. There are three kinds of Hebrew alphabet now in use—the square or Assyrian (properly called the Babylonian), the

most common; the rabbinical, or mediæval; and the cursive, or alphabet used in ordinary writing.

The extant classical Hebrew writings embrace a period of more than 1000 years from the era of Moses to the date of the composition of the books of Chronicles, which stand last in the Hebrew Bible. During this period the written language underwent surprisingly little change. In passing from the book of Genesis to the books of Samuel we do not recognise any very striking difference in the language. Even those who assert that the Pentateuch as a whole is of a comparatively late era, admit the great antiquity of some of its contents, which do not differ in language from the rest. There is indeed to be observed a very decided difference in style and language between the earliest and the very latest Hebrew writings; but this change was sudden, hence Hebrew literature is distinguished into Pre-exilian and Post-exilian, the Babylonish captivity forming the break between the two. The writings which belong to the age subsequent to the Babylonish captivity differ very considerably from those which belong to the preceding age; the influence of the Aramaic or Chaldee language, acquired by the Jews in the land of their exile, having greatly corrupted the tongue. The historical books belonging to this age are the books of Chronicles, Ezra, Nehemiah, and Esther. In the prophets who prophesied during and after the captivity, with the exception of Daniel, the Aramaic impress is by no means so strong as we might anticipate, they having evidently formed their style on that of the older prophets. At what time Aramaic became the dominant element in the national language it is impossible to determine, but eventually it entirely took the place of the old Hebrew as a spoken tongue. The fragments of the popular language in the New Testament are all Aramaic; and ever since the Hebrew proper has been preserved and cultivated only as the language of the learned and of books, and not of common life.

After the return from the captivity, the Jewish literature was carefully cultivated. Under Ezra the Scriptures were collected, and arranged into a canon. The Pentateuch was publicly read, taught in schools, and translated into Aramaic. The legal or religious traditions explanatory or complementary to the law of Moses were collected and established as the oral law. These labors resulted in the *Midrash*, a general exposition of the Old Testament, divided into the *Halacha* and the *Haggada*. To the Maccabean era belong the *Apocrypha* (in Greek), various Greek versions of the Bible, and several collections of prayers, poems, and proverbs. To the succeeding epoch belong some celebrated doctors of the law—Hillel, Shammai, Gamaliel, and others; while the age following the destruction of Jerusalem (A.D. 70) witnessed the completion of the New Testament and the works of Josephus, written, however, in the Greek language. On being driven from their capital by the Romans, numerous schools were established by the Jews in which their language and literature were taught. Of these schools the most celebrated were those of Babylon and Tiberias. The *Mishna*, which contains the traditions of the Jews and interpretations of the Scriptures, is supposed to have been compiled in the latter part of the second or in the earlier part of the third century; and the rabbis of Tiberias and Babylon wrote numerous commentaries on it. These commentaries were at length collected into two separate works, the Jerusalem and the Babylonian *Talmuds*. The Jerusalem *Talmud* seems to have been completed about the end of the fourth century, and the Babylonian *Talmud* about a century later, under the care of Rabbi Ashe. What are called the *Targums*—that is Aramaic translations of portions of the Old Testament—belong partly to times somewhat anterior, partly to times subsequent to this period. The Jews latterly adopted the languages of the various peoples among whom they happened to dwell, though they also wrote in classical Hebrew as well as in the less pure form of the *Rabbinical* Hebrew. The most brilliant epoch of mediæval Jewish literature is that of the domination of the Moors in Spain. Of modern literature in the Hebrew language there is little that is of general interest.

Hebrews (hē'brōs), EPISTLE TO THE, one of the books of the New Testament, the canonicity and authorship of which have been much discussed. The immediate successors of the apostles (Clement of Rome, Justin Martyr, etc.) seem to have considered it as of canonical authority. Its canonicity was also maintained by St. Jerome, by the almost universal consent of the Latin and Greek churches, and by Ambrose of Milan; while in 416 a decretal of Innocent I was issued in favor of this view. As to the authorship, the early Roman church denied its Pauline origin. In Carthage it was (in the second century) ascribed to Barnabas, while at the same time in Alexandria it was ascribed to Paul. This view was supported by Clement of Alexandria, and Origen, the

former believing that it was written by Paul in Hebrew, and translated into Greek by Luke. Latterly the Pauline authorship became generally accepted throughout Christendom, but in modern times the prevalent opinion is that Paul was not the author. The epistle was probably addressed to a Jewish section of the Roman church, although some maintain that it was addressed to Jews of Alexandria. If the latter view be correct Apollos may be the author, although tradition seems to favor the claim of Barnabas. The question is apparently one incapable of settlement.

Hebrides (heb'-ri-dēz), or WESTERN ISLANDS (the *Heboudai* of Ptolemy, and *Hebudes* of Pliny, the *r* being an erroneous insertion), a series of islands and islets off the west coast of Scotland, usually divided into the Outer Hebrides (popularly called the Long Island), and the Inner Hebrides. The islands within the Firth of Clyde are not now considered as part of the Hebrides. The Hebrides are divided between the shires of Ross, Inverness, and Argyle. They number upwards of 400 in all, but only about 90 are inhabited; area, about 2800 square miles; population, about 100,000. The islands are, on the whole, mountainous, and abound in moss and moors. Although humid, the climate is mild. The soil is mostly poor, and agriculture, except in certain localities, especially Islay, is very backward. Oats and barley, with potatoes and turnips, constitute almost the entire produce of the soil. Cattle-rearing and fishing are staple industries. The land is mainly occupied by sheep-farmers, and by great numbers of crofters occupying small pieces of arable land and having often the right in common with others to a tract of rough pasture. There are also many cottars or subtenants, and excess of population has arisen in various localities from the minute subdivision of land. The condition of the inhabitants generally, is very depressed; their dwellings miserable—the older being without chimneys or windows—and their living poor. Gaelic is the universal language, although English is tolerably well known. The Hebrides were early colonized by Norwegians, and belonged to Norway from the ninth to the thirteenth century, being annexed to Scotland in 1265. In 1346 a chief of the Macdonald clan assumed the title of 'Lord of the Isles,' and he and his successors affected a sort of semi-independence, but the Hebrides were finally annexed by James V in 1540.

Hebron (hē'brun; anciently *Kirjath-arba* or *Mamre*, now *El-Khalil*), a town in Palestine, 18 miles south by west of Jerusalem, 2835 feet above sea-level. It lies in the narrow valley of Mamre, and was one of the three cities of refuge west of the Jordan. Its streets are narrow and dirty. A mosque, called *El-Haram*, formerly a church, contains the alleged tombs of Abraham, Isaac, Jacob, Sarah, etc. Hebron is one of the oldest of existing towns. It was the residence of Abraham and the patriarchs, and at one time of David. Pop. about 15,000.

Hecatæus (hek-a-tē'us), an eminent ancient Greek historian and geographer, born (probably) about 550 B.C.; died about 476 B.C. He visited Egypt, Thrace, Greece, the coasts of the Euxine, Italy, Spain, and Africa. His two great works were his *Tour of the World* and his *Genealogies* or *Histories*. Only fragments of his writings are extant.

Hecate (hek'à-tē, or he'kàt), an ancient Greek goddess, whose powers were various. She could bestow wealth, victory, and wisdom; good luck on sailors and hunters; prosperity on youth and on the flocks. She was latterly confounded with other divinities, such as Demēter, Artēmis, and Persephonē (Proserpine), and finally became especially an infernal goddess, and was invoked by magicians and witches. Dogs, honey, and black female lambs were offered to her at places where three roads met. She was often represented with three bodies or three heads, and with serpents twined round her neck.

Hecatomb (hek'a-tom, or hek'a-tōm; Greek *hecaton*, a hundred, *bous*, an ox), in ancient Greek worship literally a sacrifice of a hundred oxen, but applied generally to the sacrifice of any large number. It was necessary that the victims should be without blemish. Only parts such as the thighs, legs, or hide were burned, the rest furnishing the festive meal at the close of the sacrifice.

Heckles (hek'lz), or HACKLES, an apparatus employed in the preparation of animal and vegetable fibers for spinning. It consists of a series of long metallic teeth, through which the material is drawn so as to comb the fibers out straight and fit them for the subsequent operations. The teeth are fixed in a wooden or metallic base, in several rows, alternating with each other at short distances apart.

Heckmondwike (hek'mund-wik), a thriving town of England, county of York (West Riding), with extensive blanket, carpet, woolen

cloth, and woolen yarn manufactories. Pop. 9017.

Hecla, or HEKLA (hek'la), a volcano of Iceland, about 20 miles from its southwest coast, about 5000 feet in height, and having several craters. It is composed chiefly of basalt and lava, and is always covered with snow. Many eruptions are on record. One of the most tremendous occurred in 1783, after which the volcano remained quiescent till September, 1845, when it again became active, and continued with little intermission till November, 1846, to discharge ashes, some masses of pumice-stone, and a torrent of lava. The last outbreak was in 1878.

Hector (hek'tur), the son of Priam and Hecuba, the bravest of the Trojans, whose forces he commanded. His wife was Andromache. His exploits are celebrated in the *Iliad*. Having slain Patroclus, the friend of Achilles, the latter sought revenge, and Hector was slain by him. The body of Hector was dragged at the chariot wheels of the conqueror; but afterwards it was delivered to Priam for a ransom, who gave it a solemn burial. Hector is the most attractive warrior in Homer's *Iliad*, in which one of the finest episodes is his parting from Andromache before his last combat.

Hector, ANNIE ALEXANDER, an Irish novelist, born in 1825; died in 1902. Under the title of Mrs. Alexander she wrote many popular novels, among the best known of them being *Her Dearest Foe* and *The Wooing o't*.

Hecuba (hek'ū-ba), of Phrygia, in Greek legend the second wife of Priam, king of Troy, to whom she bore Hector, Paris, Cassandra, Troilus, and other children. After the fall of Troy she was given as a slave to Odysseus, and, according to one form of the legend, in despair leaped into the Hellespont.

Heddle (hed'l), in a loom, one of the parallel double threads which are arranged in sets, and with their mounting, compose the *harness* for raising the warp threads to form the shed and allow the shuttle to pass. Each heddle has a loop or eye in its center, through which a warp thread passes.

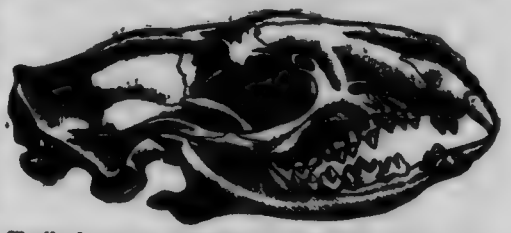
Hedera (hed'ér-a), the genus to which ivy belongs.

Hedge (hedj), a fence formed of living trees or shrubs. Hedges are often composed of one or more of the following:—Hawthorn, crab, blackthorn, holly, privet, beech, hornbeam, maple, barberry, furze, broom, alder, poplar, willow, yew, box, arborvitæ, sweet-briar, etc. Although superior to dry-stone walls, they take up much room, and exhaust the soil to some extent. Hedges are probably more common in England than in any other country, though they were not so common till the close of the seventeenth century. They are increasing in use in the United States, various plants being used, among which privet has recently become very popular.

Hedgehog (hedj'hog; *Erinaceus Europæus*), an insectivorous animal, covered with spines in lieu of hair. By means of a special muscle it is able to roll itself up into a ball,

Hedgehog (*Erinaceus Europæus*).

and in this form can defy most of its enemies. It has a rudimentary tail, elongated nose, short ears, with a cranium comparatively broad. The hind feet have five toes, and strong coarse hair covers some parts of the body. The teeth are numerous. Including the tail, it attains a length of 11 inches. It usually resides in small thickets, and feeds on fruits, roots, and insects. It is fond of raw or roasted flesh, and devours cockroaches in large numbers when kept in houses. It hibernates in winter. The female bears four to eight young at a birth, the young soon becoming covered with prickles. It is found in most parts of Europe. Other species are found in Asia and Africa.



Skull of common Hedgehog (*Erinaceus Europæus*).

Hedgehog Plant, a name bestowed on leguminous plants of the genus *Medicago* (especially *M. infestata*) whose pods are spirally twisted and rolled up into a ball and furnished with prickles.

Hedge-mustard (*Sisymbrium*), a cruciferous plant, common in waste places.

Hedin, Sven, a Swedish traveler, born at Stockholm in 1865. He traveled in Persia and Mesopotamia in 1885–86, was sent on an embassy to Persia in 1890, and continued his travels in Asia until 1897, crossing through East Turkestan, the Pamir, and North Tibet. Returning in 1906, he continued his explorations in an almost unknown region, the vast expanse of West Tibet, which he crossed twice from north to south, finding the country wildly mountainous, with intervening valleys and many lakes, generally salt. He returned in 1908, having discovered the true sources of the Bramaputra and Indus rivers. He wrote *Through Asia* and other works.

Hedjaz. See *Hejaz.*

Hedjrah. See *Hejra.*

Hedonism (hē'don-ism), the ethical theory according to which pleasure is held to be the chief good. In Greek ethics hedonism was represented by the Cyrenaic and Epicurean schools. The classical exposition of the modern type of hedonism is found in Mill's *Utilitarianism,* although his argument is generally admitted not to be free from serious inconsistencies. Utilitarianism really aims at the greatest happiness of the greatest number, a collective rather than individual good.

Hedysarum (he-dis'a-rum). See *French Honeysuckle.*

Heem (hām), Jan David de, a Dutch painter of fruit, flowers, and still life, born in 1600; died in 1674. He studied under his father, and soon obtained large sums for his pictures, which are characterized by great delicacy and attention to detail and truth and brilliancy of coloring. His *Madonnas,* etc., bordered with garlands of fruits and flowers, were also famous.

Heeren (hā'rèn), Arnold Hermann Ludwig, a German historian, born in 1760; died in 1842. In 1776 he entered the gymnasium of Bremen, and in 1784 took his degree of Doctor of Philosophy at Göttingen. In 1787, after returning from his travels in Italy, he became professor extraordinary of philosophy at the same university. In 1801 he was elected professor of history. His writings combine extreme accuracy of statement with picturesqueness of style. His principal productions are *Geschichte der classischen Lieder im Mittelalter; Handbuch der Geschichte der Staaten des Alterthums,* etc.

Hegel (hā'gl), Georg Wilhelm Friedrich, a celebrated German metaphysician, born at Stuttgart in 1770; died in 1831. He studied at the theological institute of Tübingen from 1788-93, and was next a private tutor at Berne (1793-96), and subsequently at Frankfort-on-the-Main (1797-1800). Having removed to Jena, and contracted an intimacy with Schelling, he devoted himself to metaphysical study. After the battle of Jena, Hegel was employed on a newspaper at Bamberg until 1808, when he became successively rector of Nürnberg Gymnasium, professor of philosophy at Heidelberg (1816), and at Berlin from 1818 to his decease in 1831. Among his works the most important are his *Phänomenologie des Geistes* (1807), *Wissenschaft der Logik* (1812-16), *Encyclopädie der philosophischen Wissenschaften* (1817), and *Grundlinien der Philosophie des Rechts oder Naturrecht und Staatswissenschaft* (1821). The philosophy of Hegel followed that of Schelling, in adopting as a presupposition the indentity of Knowing and Being, of Thought and Reality, of Subjective and Objective. But he differs from Schelling, who contemplates this indentity with its inner opposites through the medium of a purely intellectual intuition, for Hegel seems rather to revert to Kant's Transcendental Logic. He thus asserts that if the order and connection of our thoughts is involved in the order and connection of things, the universal form in the course of objective action must exactly agree with the form of the development of our thoughts, and *vice versa.* As there are, according to him, three stages in the process of thought and existence, his system has necessarily a threefold division: logic; the philosophy of nature; and mental philosophy. Hegelianism has been more influential in the direction of the philosophy of religion than in any other department; but it is divided into three ...ps, representing respectively the su...atural, the rational, and the mystical.

Hegira (hej'i-ra.) See *Hejra.*

Heide (hī'dė), a town of Prussia, in Holstein, with manufactures of paper, etc. Pop. (1905) 8758.

Heidelberg (hī'dl-berk), a town of Baden, beautifully situated on the left bank of the Neckar, here crossed by two bridges, in one of the loveliest districts of Germany. It stands on a narrow strip between the river and the castle-rock and Geisberg, spurs of the Königstuhl (1850 ft.); and chiefly consists of one main street and less important cross and parallel streets. The principal

buildings are: the church of St. Peter; the church of the Holy Ghost; the castle, anciently the residence of the Electors Palatine; the university, founded in 1386, and now possessed of a library of 500,000 volumes and attended by about 1000 students; the town-house, etc. The castle, begun late in the thirteenth century, and exhibiting elaborate examples of early and late renaissance architecture, is the most

Castle and Town of Heidelberg.

remarkable edifice in Heidelberg. It is now an ivy-clad ruin, but is carefully preserved from further decay. The principal industry is brewing. Pop. (1910) 56,016.

Heidelberg Catechism. The Heidelberg of Palatinate Catechism is of greater importance than any other as a standard of the German reformed churches. It was compiled by the Heidelberg theologians, Caspar Olevian and Zacharias Ursinus, at the request of the Elector Frederick III of the Palatinate; it was published in 1563, was approved by several synods, and was subjected to revision by the Synod of Dort.

Heidenheim (hī'dĕn-hīm), a town of Würtemberg, 46 miles E. S. E. Stuttgart. It has manufactures of woolen and linen cloth, etc. Pop. (1905) 12,173.

Heights, Measurement of, or Hypsometry, is that department of geodesy which treats of the measurements of the absolute or relative heights of various points on the earth's surface. In all cases in which great accuracy is essential, trigonometrical methods must be employed, but in other cases sufficiently accurate results may be obtained by leveling, by the use of the barometer, or by the boiling-point of water as given by the thermometer. The trigonometrical method is often the only one available, as the height to be measured may be quite inaccessible. The barometric method is based on the fact that as the mercurial column is supported by the atmospheric pressure, it must fall when conveyed from a lower to a higher level, as in the latter case the pressure is diminished. Were the atmosphere uniform in density throughout, nothing could be simpler than the measurement of heights by the barometer, but gases being very compressible, the lower strata of the atmosphere are denser than the upper strata, being exposed to greater pressure. Thus a column of air 100 feet high has far greater weight at the sea-level than a similar column at the top of a mountain 4000 feet high; and the effect on the barometric column of rising 100 feet from sea-level is correspondingly greater than the effect of rising 100 feet from a height of 4000 feet above the level of the sea. Moreover, increase of temperature affects the density of the mercury in the barometer, and also that of the air, and further complicates the problem. Hence for the greatest accuracy in determining the difference of levels

two mercurial barometers and four thermometers are required. Two of the thermometers are used for determining the temperature of the air at the stations, and two are attached to the barometers for determining the temperature of the mercury. The observations are made simultaneously. The aneroid barometer is in some respects more suitable than the mercurial, being much more portable, and requiring two thermometers only. After the necessary observations are made the required height may be calculated by the use of certain logarithmic formulæ, or by the rough method stated under *Barometer*. Tables obviating the use of logarithms are often supplied by instrument makers along with aneroid barometers. The method in which use is made of the principle that water boils at the temperature of 212° under the full pressure of the atmosphere but at a lower temperature with a smaller atmospheric pressure, such as is given by an elevated position, is simple and sufficiently accurate for many purposes. It has been found that if water at the sea-level boils at 212°, on rising 510 feet it will boil at 211°, and so on.

Heilbronn (hīl-bron'), a town of Würtemberg, beautifully situated on the Neckar, largely mediæval in architecture in the older parts, but having modern suburbs. Its finest edifice is the old Gothic church of St. Kilian. It has flourishing industries. Heilbronn was long an imperial free town. Pop. (1910) 42,709.

Heiligenstadt (hī'li-gen-stät), a town of Prussia, prov. Saxony, on the Leine. It has cigar and other manufactures. Pop. 7955.

Heilprin (hīl'prin), ANGELO, geologist, born in Hungary in 1853, was brought to America in 1856, and became a student in and director of the Academy of Natural Sciences of Philadelphia. Was president for five years of the Geographical Society of Philadelphia, leader of the Peary Relief Expedition of 1892, and traveled in many countries. He wrote *Geographical and Geological Distribution of Animals*, *Geological Evidences of Evolution*, *The Arctic Problem*, with works describing the 1902 eruption of Mont Pelee, which he investigated. He died July 17, 1907.

Heimdall (hīm'dal), a divinity in the Scandinavian mythology, who keeps watch on the bridge Bifröst, which connects the domain of the Æsir or Gods with that of men. His sight and hearing are acuter than those of mortals, and nothing can evade his vigilance.

Heine (hī'nē), HEINRICH, a German poet and author, was born of Jewish parents at Düsseldorf in 1799, and died at Paris in 1856. He studied law at Bonn, Berlin, and Göttingen; took his degree at the last-mentioned place, and in 1825 embraced Christianity. He afterwards lived at Hamburg, Berlin, and Munich, but in 1830 he settled in Paris, supported himself by his literary labors, and dwelt there until his death. From 1837 to the overthrow of Louis Philippe in 1848 he enjoyed a pension of 4800 francs from the French government. Of the numerous literary works of Heine there may be mentioned in particular—*Gedichte* ('Poems'); *Reisebilder* ('Pictures of Travel'); *Buch der Lieder* ('Book of Songs'); *Deutschland Ein Wintermärchen* ('Germany, a Winter Tale'); *Atta Troll; Romancero*, etc. As a poet Heine is remarkable for the simplicity and pathos of many of his lyric pieces. His powers of wit and raillery were also great, but he often transgressed the bounds of propriety and decorum. Scepticism and oversensuousness are his two prominent characteristics. During the latter years of his life he suffered great agony from a spinal complaint, which confined him almost constantly to bed.

Heineccius (hī-nek'se-us), JOHANN GOTTLIEB, a German writer on logic, jurisprudence, and ethics, born in 1681; died in 1741. His works on Roman law were highly valued.

Heinrich (hīn'rik), the German form of *Henry*.

Heinsius (hīn'si-us), DANIEL, a Dutch scholar, poet, and critic, born 1580; died 1655. He studied at Franeker and Leyden, at the latter under Joseph Scaliger; became professor of history and politics at Leyden in 1605, and librarian and secretary in 1607. He published editions of Hesiod, Horace, Virgil, and other classical writings, and wrote Latin and Greek poems.

Heir (ār). See *Descent*.

Heir-apparent, the person who necessarily succeeds to the ancestor if he survives him, because no other person can ever gain precedence over him, as an eldest son. Compare *Heir-presumptive*.

Heirloom (ār'lōm), in law, means some personal chattel which goes by special custom to the heir-at-law, together with the inheritance. The term is often applied to the case where certain chattels, such as pictures, etc., are directed by will to follow along with the estate.

Heir-presumptive is one who, if the ancestor should die immediately, would, under existing circumstances, be his heir, but whose right of inheritance may be defeated by some nearer heir being born, as an only daughter, who is displaced by the birth of a son. Compare *Heir-apparent*.

Hejaz (hej-ăz') or HIJAZ, a division of Arabia, extending along the north half of the east coast of the Red Sea, comprehending a lowland (Tehâma) and a tract of highlands, east of a range of mountains attaining a height of perhaps 8000 feet. Mecca, Medina, Jiddah, and Yambo are the chief towns, the first two being annually resorted to by vast numbers of pilgrims. Long a part of Turkey, it declared its independence in 1917.

Hejra, HEJIRA, or HEGIRA (hej'i-ra), an Arabic word signifying emigration. The Mohammedans designate by it the flight of Mohammed their prophet from Mecca to Medina. From this flight, which happened on the 13th of September, 622 A.D., but which they fix on the 16th of July of the same year, they begin their computation of time.

Hel, the Norse goddess of the dead, who dwells beneath one of the three roots of the ash Yggdrasil; daughter of Loki. Dark rivers surround her abode; a dog watches without; the horse she rides has three feet; she herself is half black and half of fair complexion.

Helamys (hel'a-mis), the jumping-hare or jumping-rat, a genus of rodent animals allied to the jerboas.

Helbeh (hel'be), the seed of a plant of the leguminous genus *Trigonella* (fenugreek), with a somewhat bitter taste, whose flour, mixed with dhurra, is used as food by the laborers of Egypt.

Helder (hel'dĕr), a fortified seaport of Holland, in the most northern part of the province of North Holland, opposite the island of Texel, and commanding the entrance to the Zuider Zee. From a fishing town Napoleon converted it to a fortress and naval station of the first rank, and called it his Northern Gibraltar. Being much exposed, the port and coasts are protected by gigantic dikes, one 6 miles long and built entirely of Norwegian granite. Pop. 27,458.

Helen (hel'en), or HEL'ENA, in ancient Greek legend, the most beautiful woman of her age, daughter of Zeus by Leda. By advice of Ulysses her numerous suitors were bound by oath to respect her choice of a husband, and to maintain it even by arms. She chose Menelaus, but was afterwards carried off to Troy by Paris, the Trojan war arising from the claim made by Menelaus for the fulfilment of the oath. After the death of Paris she married his brother Deiphobus. On the fall of Troy she returned to Sparta with Menelaus, but was murdered at Rhodes.

Helena (hel'e-na), a city, capital of Phillips County, Arkansas, about 100 miles E. of Little Rock. It is on the Mississippi, 75 miles below Memphis, has cotton gins and presses and lumber mills and is an important cotton shipping point. Pop. 8772.

Helena, a city, capital of the state of Montana and of Lewis and Clark County, is in Prickly Pear Valley, near the Rocky Mountains, and 14 miles W. of the Missouri River. It is traversed by the North Pacific and Great Northern railroads. Here are rich gold mines, and silver, copper, and lead are found and mined. The city has smelters and other industries, and contains the state capitol and other public buildings. Pop. 12,515.

Helena, the name of several saints, of whom the chief was the mother of the Emperor Constantine the Great, a woman of humble origin, and a native either of Bithynia or of Britain. She became the wife of Constantius Chlorus, who, however, was compelled to repudiate her when made Cæsar by Diocletian in 292 A.D. At the same time he made her son his sole heir, and Constantine, on his accession, took her to reside with him at the palace, and gave her the title of Augusta. She did much for the advancement of religion, and is said to have discovered the *true cross*, in honor of which she founded the Church of the Holy Sepulcher at Jerusalem. She died shortly after at the age of eighty, in 328 or 326 A.D.

Helena (he-lē'na), ST., an island in the South Atlantic, belonging to Britain, about 850 miles southeast of the Island of Ascension, 1150 miles west from the west coast of S. Africa, and 2000 miles from the east coast of Brazil; greatest length, 10½ miles; greatest breadth, 7 miles; area, about 47 square miles. Its position, in the ocean thoroughfare from Europe to the East, has made it a place of call for vessels, while it has acquired special celebrity as the place of Napoleon's banishment, and where he resided from 1816 till his death in 1821. It has precipitous and almost inaccessible coasts, particularly on the north, where nearly perpendicular cliffs rise to a height of from 600 to 1200 feet. The only town on the island is James Town, which has a fine natural harbor,

and affords excellent anchorage in 12 fathoms. The island, which is of volcanic formation, derives its name from having been discovered by Juan de Nova Castilla on St. Helena's Day. It was afterwards possessed by the Dutch, and finally was ceded to the English about 1651. During the British-Boer War (1900) Com. Cronje and over 4000 of his army were deported here after their capture by the British under Gen. Kitchener. Pop. about 5000.

Helensburgh (hel'enz-bur-rō), a town of Scotland, in Dumbartonshire, at the entrance of the Gare Loch, on the north shore of the Firth of Clyde, opposite Greenock, from which it is distant about 4 miles. It is chiefly a residential town and summer resort for Glasgow and neighboring towns. It takes its name from Helen, wife of Sir James Colquhoun, by whom it was founded in 1777. Pop. 8554.

Helenus (hel'en-us), a Trojan soothsayer, son of Priam and Hecuba, twin-brother of Cassandra, and husband of Andromache after Hector's death. He foretold the destiny of Æneas.

Heliacal (he-lī'a-kal), in astronomy, rising or setting at the same time, or nearly the same time, as the sun. The heliacal rising of a star is when, after being in conjunction with the sun and invisible, it emerges from the light so as to be visible in the morning before sunrising. On the contrary, the heliacal setting of a star is when the sun approaches so near as to render it invisible by its superior splendor.

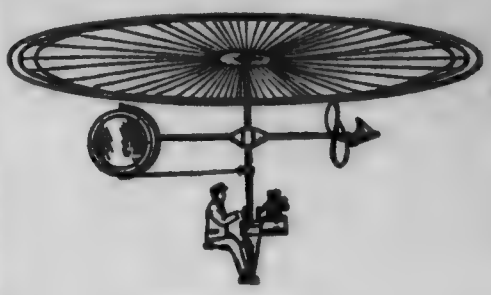
Helianthemum (hē-li-an'the-mum), a genus of herbaceous undershrubs and shrubby or creeping plants; the rock-rose genus.

Helianthus (hē-li-an'thus), a genus of Compositæ, chiefly North American annual or perennial herbs, with rough leaves and large yellow flowers, of which the common sunflower (*H. annuus*) and the *H. tuberosus* (the Jerusalem artichoke) are examples.

Helicidæ (he-lis'i-dē), the general name by which the land shell-snails are distinguished. See *Helix*.

Helicon (hel'i-kon; now *Sagara*), a mountain range of Greece, in the west of Bœotia, in some sense a continuation of the range of Parnassus. It was the favorite seat of the Muses, who, with Apollo, had temples here. In it also were the fountains of Aganippe and Hippocrene. The highest summit, now called *Pelecovni*, is barely 5000 feet high.

Helicopter (hel'i-kop-tėr), an aeroplane flying machine with a vertical screw arrangement to lift it into the air, and other power apparatus to give it horizontal motion. It has



Villard's Helicopter.

not yet been practically realised, though some experiments have been made.

Helictis (hel-ik'tis), a genus of carnivorous quadrupeds, allied to the skunks, of which there are at least two species, one (*H. moschata*) found in China, the other (*H. nepalensis*) in India.

Helier (hel'yėr), St., the capital of the island of Jersey, on the south coast, on the east side of St. Aubin's Bay. It is protected by two fortresses, Elizabeth Castle on a rock in the bay, opposite the town; and Fort Regent, overlooking the inner harbor. The chief public buildings are Parliament House, the court house, and the public library. The harbor, docks and quays are commodious, and there is a considerable shipping trade. The mild climate and cheapness of living make it a favorite place of residence and summer resort. It is the seat of the states, or representative parliament of Jersey, and the terminus of two small railways. Pop. about 30,000.

Heligoland (hel'i-gō-land; Germany, *Helgoland*—Holy Land), an island belonging to Germany, in the North Sea, about 40 miles from the mouth of the Elbe; 1 mile long and 1/3 mile broad; highest point 200 feet. Its rocks present a perpendicular face to the sea, but are being rapidly corroded by the waves. The inhabitants, of Frisian descent, are mainly fishers and pilots, but the town is a popular bathing resort. Heligoland was captured by Britain from Denmark in 1807, and conceded to Germany in 1890, being annexed to the Prussian province of Schleswig-Holstein in 1892. It was strongly fortified and was of great importance in the European war (q. v.), 1914-18, as an aeroplane and

naval base. The treaty of peace, 1919, ordered the forts destroyed. Pop. 3000.

Heliodorus (hel-i-o-dō'rus), a Greek romance writer, born at Emesa, in Syria, about the fourth century. The work that has come down to us is the *Æthiopica*, the oldest and best of the Greek romances. It is a tale of adventure in poetical prose, with an almost epic tone. The romance is supposed to have been written in his early years before he became a Christian and Bishop of Tricca in Thessaly. It is, however, sometimes asserted that Heliodorus was a sophist of the third century, who has been erroneously confounded with the bishop.

Heliogabalus (hel-i-o-gab'a-lus), or ELAGABALUS, a Roman emperor, son of Sextus Varius Marcellus; born about A.D. 205, and originally called *Varius Avitus Bassianus*. He received his name from having been, while still a child, priest of Elagabalus, the Syro-Phœnician sun-god. After the death of Macrinus he was invested, at the age of fourteen, with the imperial purple, but his licentiousness soon displeased the populace, and he was slain in an insurrection of the prætorians, A.D. 222, after a reign of less than four years.

Heliograph (hē'li-u-graf), or HELIOSTAT, a name given to various contrivances for reflecting the sun's light either temporarily or continuously to an observer at a distance. The simplest heliostat is a mirror hung up at a distant station so as to reflect a flash to the observer whose station may be many miles from it. This mirror is generally so adjusted that the flash occurs exactly at some prearranged hour, and by being in readiness the observer can get an observation with precision as regards time. Some heliostats are visible for 200 miles. By being fitted with an adjustment of clock-work, the mirror can be made to revolve with the sun, and thus reflect a beam of sunlight steadily in one direction, being then called also *heliotrope*. The heliostat has been used for signaling in war.

Heliogravure (hē-li-o-gra'vūr), a term used to denote the process of photo-engraving or a print obtained by that process; strictly a photo-engraved metal plate. Originally any process by which engravings were printed either like woodcuts or like copperplates was called photogravure.

Heliolite (hē'li-u-lit), a synonym of sunstone or aventurine felspar.

Heliometer (hē-li-om'e-tėr), an instrument for measuring small distances on the sky, particularly the apparent diameters of the sun and of the moon. In the common modern form the object-glass of the telescope is cut into two halves, relatively movable by a screw. Each half forms a perfect image in the focus of the eye-piece, and by varying the distance between the half-lenses the images may be made to diverge from, or approach, each other. If, in contemplating a celestial body, the object-glasses are placed so as to bring the images to touch each other, the distance of the centers of the object-glasses, measured in seconds, gives the diameter of the image.

Heliopolis (hē-li-op'u-lis; City of the Sun), the Greek name of the city called by the Egyptians On, An, stood on the E. side of the Pelasiac branch of the Nile, near the apex of the Delta, and was one of the most ancient and important of Egyptian cities. It was the chief seat of the wisdom of the Egyptians, and Thales, Plato, and Solon are reported to have learnt from its priests. The obelisk called 'Cleopatra's needle,' taken in 1878 to England, and then brought to New York in 1880, was originally transported to Alexandria from this city.

Heliopolis, in Cœlosyria. See *Baalbek*.

Heliopsis (hē-li-op'sis), a genus of plants of the family *Asteraceæ*, comprising about seven species.

Heliophila (hē-li-of'i-la), a genus of plants of the family *Brassicaceæ*, consisting of about ten species of South African herbs or shrubs.

Heliornis (hē-li-or'nis), a genus of lobiped birds of the family *Heliornithidæ*, which comprises the sun-birds, sun-grebes, coot-grebes or finfoots. Also, in entomology, a genus of lepidopterous insects.

Helios (hē'li-os), the god of the sun (Latin, *Sol*) in the Greek mythology; son of Hyperion and Theia, and brother of Eos (Aurora, the dawn) and Selēnē (Luna, the moon). He dwells with Eos in the ocean behind Colchis, from which he issues in the morning, and to which he returns at night. His worship was extensively diffused, and he had temples in Corinth, Argos, Trœzene, and Elis, but particularly in Rhodes, the Colossus of which was a representation of Helios.

Helioscope (hē'li-u-skōp), a telescope fitted for viewing the sun without distressing the eyes, as when the image of the sun is received upon mirrors formed simply of surfaces

of transparent glass which reflect only a small portion of the light.

Heliostat (hē'li-u-stat). See *Heliograph*.

Heliotherapy (hēl-i-ō-ther'a-pi), the method of treating disease by exposing the naked body to the sun's rays. It has been found particularly helpful for tuberculosis of the bones, joints and ganglions, though it has been used with success in other diseases also, including acute rheumatism and even certain affections of the eye.

Heliotrope (hē'li-u-trōp), a genus of plants (*Heliotropium*), nat. order *Boraginaceæ*. The species are herbs or undershrubs, mostly natives of the warmer parts of the world, and have alternate leaves and small flowers usually disposed in scorpioid cymes. *H. Europæum*, the common heliotrope, is indigenous in the south and west of Europe and has small white or pale red flowers with a fruit of four drupes under a thin fleshy covering. The *H. Peruvianum* is a very fragrant garden plant, growing to about 2 feet in height and bearing small lilac-blue flowers.

Heliotrope (Jenny Lind variety).

Heliotrope, the bloodstone, a variety of quartz, partaking of the character of jasper or of chalcedony. It is of a deep green color, and covered with red spots. It is hard, and is used for burnishers; the more finely-marked stones are prized for seals, signet-rings, etc. It is found in Tartary, Persia, Siberia; in the island of Rum, Scotland, and elsewhere.

Heliotype (hē'li-u-tīp), a photographic process by which pictures can be printed in the same manner as lithographs, depending on the fact that a dried film of gelatine and bichromate of potash, when exposed to light, is afterwards insoluble in water, while the portion not so exposed swells when steeped. A mixture of gelatine, bichromate of potash, chrome alum, and water is poured on a plate of glass, where it shortly settles into a film. When dried the film contracts and separates from the glass. A picture is then printed on it from a negative, after which it is attached to a plate of zinc, and copies are taken from it by inking it with lithographic ink exactly as in the ordinary lithographic process. The films are technically called 'skins.' Sometimes a gutta-percha mold is prepared from the film, and copper deposited on it by the electrotype process, the plate thus produced being printed from in the ordinary way.

Helium (hē'li-um), a newly-discovered element, first found in the sun by its spectral lines, and so named from being supposed to be peculiar to that body. It was discovered on the earth in 1895 in the Norwegian mineral cleveite, and has since been found in various connections. It is supposed to be identical with the alpha ray given off by radium. Its atomic weight is double that of hydrogen.

Helix (hē'liks), (1) a spiral line as of wire in a coil, or such a curve as is described by every point of a screw that is turned round in a fixed nut. (2) In architecture, a small volute or twist under the abacus of the Corinthian capital, of which in every perfect capital there are sixteen, at each angle, and two meeting under the middle of each face of the abacus.

Helices of Corinthian Capital.

Helix, a genus of gasteropodous molluscs, comprising the land shell-snails. The common garden snail (*H. hortensis*) and the edible snail of France (*H. pomatia*) are examples.

Hell (A. Saxon, *hel*, from *helan*, to cover), signifies originally the covered or invisible place. In the English Bible the word is used to translate the Hebrew *sheol* (grave or pit) and *Gehenna* (properly the valley of *Hinnom*), as well as the Greek *Hades* (the unseen). In the Revised Version of the New Testament, however, hell is used only to translate *Gehenna*, *Hades* being left where it stands in the Greek. In common usage hell signifies the place of punishment of the wicked after death, its earlier meaning being lost. The distinctive Scripture term for the place of future punishment of the wicked is Gehenna, which, unlike Sheol and Hades, never has an intermediate signification; and Christ adopting on this point the current language of the time gave the sanction of his authority to the leading ideas involved in it. Gehenna, or hell, is with him the place of final torment. The Eastern and Western churches are at one as to the punishment of hell being partly 'a pain of loss,' that is, the consciousness of being debarred the presence of God, and partly a 'pain

of sense,' that is, real physical suffering. The prevailing idea among modern theologians is that the 'fire' and the 'worm' are significant emblems to give us the most correct and living conceptions of the reality that we can possibly attain in our present circumstances.

Helladotherium (hel-a-do-ther'i-um), an extinct genus of ungulate quadrupeds allied to the existing giraffe. Fossil remains occur in the upper Miocene rocks of Attica.

Hellas, HELLENES. See *Greece.*

Hellbender, a popular name for the Menopome (which see).

Hellebore (hel'e-bōr; *Helléborus*), a genus of plants, nat. order Ranunculaceæ, consisting of perennial low-growing plants with palmate or pedate leathery leaves, yellowish, greenish, or white flowers, having five conspicuous persistent sepals, eight to ten small tubular petals, and several many-seeded carpels. *H. orientalis* is the species which produced the black hellebore of the ancients. *H. niger*, the Christmas-rose common in gardens, is a native of South and East Europe, and is the source of the black hellebore of modern pharmacopeias. The whole of these plants are accounted purgative, and in large doses act as a narcotic acrid poison; but they are now little used in medicine. *Veratrum album*, order Melanthaceæ, a very different plant, is known as white hellebore. It is extremely acrid, and in the form of powder is used to destroy caterpillars.

Black Hellebore or Christmas-rose (*Helléborus niger*).

Hellen (hel'en), in Greek mythology, son of Deucalion and Pyrrha, and founder by his three sons Dorus, Æolus, and Xuthus of the great branches of the Greek people or Hellenes.

Hellenists (hel'en-ists), a name for those Jews who, especially in Egypt after the time of Alexander the Great, became imbued with Greek culture and civilisation, and spoke and wrote in Greek. To them was due the formation of the peculiar dialect termed the *Hellenistic* dialect of Greek, the special feature of which was its use of foreign, and more particularly of Hebrew and Aramaic words and idioms. The most noted of the Jewish Hellenistic philosophers was Philo of Alexandria, and the chief of the learned labors of the Alexandrian Jews was the Septuagint version of the Old Testament.

Hellespont. See *Dardanelles.*

Hell Gate, a formerly dangerous pass in East River, the strait which connects New York Bay with Long Island Sound. Rocks here used to form an obstruction much dreaded by mariners, but by extensive submarine mining operations the passage has been made safely navigable. Hell-gate bridge, which now spans it, is the longest of its type in the world, spanning over 1000 feet between its piers in Long Island and the Bronx. The arch intrados rises 260 feet above water and the deck is about 150 feet above river level, carries four railroad tracks, and affords continuous railroad passage from New York City to New England. It was opened in March, 1917.

Helm the contrivance by which a vessel is steered, usually composed of three parts, viz., the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. See *Steering Apparatus.*

Helmet (hel'met), an article of armor for the protection of the head, composed of leather or of metals. Some of Homer's heroes are represented as wearing brazen helmets, with towering crests. Among the Romans the *cassis* was a metallic helmet; the *galea*, a leathern one. The earlier Greek and Roman helmets did not protect the face. During the middle ages helmets were made of steel, frequently inlaid with gold, and provided with bars and flaps to cover the face in battle and to allow of being opened at other times. The full-barred helmet entirely covered the head, face, and neck,

Full-Barred Helmet.

Open Helmet.

having in front perforations for the admission of air, and slits through which the wearer might see the objects around him. The open helmet covered only the head, ears, and neck, leaving the face unguarded. Some open helmets had a bar or bars from the forehead to the chin, to guard against

the transverse cut of a broadsword. The modern military helmets afford no protection for the face. Firemen wear a heavy head-piece of leather and brass, or other materials, to protect them so far as possible from falling ruins at conflagrations. Helmets of white felt, with folds of linen wrapped round them, are worn in India and other hot climates as a protection against the sun. The name helmet is also given to a kind of hat worn by policemen. In *heraldry* the helmet is borne over a coat of arms, and the form and position of it vary according to the quality or dignity of the bearer. See *Heraldry*.

Helmet-shell, the common name of molluscous shells of the genus *Cassis*, gasteropods of the family Buccinidæ. Most of the species are inhabitants of tropical shores, but a few are found on the coast of the Mediterranean. Some of the shells attain a large size. Those of *C. rufa*, *C. cornuta*, *C. tuberosa*, and other species, are the material on which shell cameos are usually sculptured.

Helmholtz (helm'holts), HERMANN-LUDWIG FERDINAND, a German physiologist and physicist, born in 1821 at Potsdam, and educated at Berlin. In 1848 he became professor of anatomy at the Academy of Fine Arts, Berlin, and in 1849 he obtained the chair of physiology at Königsberg, from which he was successively transferred to the same post at Bonn (1855), and at Heidelberg (1858). In 1871 he was appointed professor of physics at Berlin. His work has been chiefly in those departments of physics which are in closest relation with physiology, notably in acoustics and optics. Of his many publications the best known are: *The Conservation of Force* (1847), *Manual of Optics* (1856-66), *Popular Lectures on Scientific Subjects* (London, 1873 and 1881), and *Sensations of Tone as a Physiological Basis for the History of Music* (1862, London 1875). He was ennobled by the German emperor in 1883. He died in 1894.

Helmont (hel'mont), JOHN BAPTIST VAN, born in 1577 at Brussels; in his seventeenth year gave public lectures on surgery at Louvain. Perceiving the defects of the system of Galen, he announced his intention of reforming medicine, but finally renounced its practice, and traveled for ten years. He was then induced by an empirical chemist to take up the study of chemistry, and his medical tastes reviving, he retired to Vilvorde, near Brussels, where he occupied himself till his death with medical labors. He boasted of having found the means of prolonging life, composed visionary theories on the constitution of man, and on diseases, and made some genuine discoveries in chemistry. He was probably the first to introduce the term *gas* into science, and was also first to observe the acid reaction of the gastric juice. The system of Van Helmont resembles that of Paracelsus, but is more clear and scientific. The emperors Rodolph II, Matthias, and Ferdinand II, invited him to Vienna, but he preferred the independence of his laboratory. He died in 1644, and his manuscripts were printed by Elsevir.

Helmstedt, or HELMSTADT (helmstet), a town in Brunswick, 20 miles E. S. E. of Brunswick; formerly a member of the Hanseatic League. There are a fine church of the twelfth century and buildings in the Romanesque style formerly accommodating a university abolished in 1809. Pop. 14,259.

Helmund (hel'mund), a river in Afghanistan, which it traverses diagonally northeast to southwest, and ultimately falls into the extensive Lake Hamoon, after a course of about 550 miles. Its source is 11,500 feet above sea-level.

Heloderma (hel-u-dêr'ma), a Mexican genus of lizards, of which one species at least, *H. horridum*, has been proved to be venomous, all its teeth being furnished with poison glands. It is about 3 ft. in length, has a thick and squat body covered with rough scales, forms burrows under the roots of trees, is nocturnal in habit, and is said to feed on insects, worms, millepeds, etc.

Heloise, ELOISE (â-lô-ēz'), celebrated for her beauty and wit, but still more on account of her love for Abelard; was born in Paris in 1101. After the mutilation of her lover she was persuaded by him to take the veil at Argenteuil, and ultimately became prioress of the convent there until 1129, when she entered, with some of her nuns, the oratory of the Paraclete, built by Abelard at Nogent-on-the-Seine, where she lived in exemplary piety. She died in 1164. Contemporary writers speak in high terms of her genius. She understood Latin, Greek, Hebrew, was familiar with the ancients, and well read in philosophy and theology.

Helots (hel'ots), slaves in ancient Sparta. They were the property of the state, which alone had the disposal of their life and freedom, and which assigned them to certain citizens, by whom they were employed in private labors. Agriculture and all mechanical

arts at Sparta were in their hands, and they were also obliged to bear arms for the state in case of necessity. They behaved with great bravery in the Peloponnesian war, and were rewarded with liberty (431 B.C.), but 2000 appear to have been subsequently secretly massacred. They several times rose against their masters, but were always and finally reduced.

Helper (hel'pėr), HINTON ROWAN, author, born in Davie County, North Carolina, in 1829. He lived for a time in California and wrote *The Land of Gold*. He won great notoriety by his *The Impending Crisis of the South* (1857), an antislavery work which created a great sensation. Other works were *Nojoque* and *Negroes in Negroland*. He was United States consul at Buenos Ayres, 1861-67, and died by suicide in 1909.

Helps, SIR ARTHUR, an English essayist and historian, born in 1817. He was graduated at Cambridge in 1835, and from 1859 until his death in 1875 was clerk of the privy-council. His works, which are for the most part of a pleasant moralizing type, with many indications of a fine, if not of a robust personality, comprise *Thoughts in the Cloister and the Crowd* (1835); *Catherine Douglas, a Tragedy* (1839); *Essays written during the Intervals of Business* (1841); *The Spanish Conquest of America* (1855-61); *Realmah, a Romance* (1868); *Ivan de Brion, a Russian Story* (1874), and various others. He also edited the Prince Consort's *Speeches* (1862), and the Queen's *Leaves from a Journal* (1868), receiving knighthood shortly before his death.

Helsingborg (hel-sing-bor'), a seaport in Sweden, at the narrowest part of the Sound, opposite Elsinore. It has manufactures of leather, dye-works, tile-works, salt-works, and a spacious harbor. Pop. 33,843.

Helsingfors (hel-sing-fors'), a seaport of Russia, capital of Finland, on a peninsula in the gulf of that name, 180 miles W. N. W. St. Petersburg. Helsingfors is the residence of the governor, the seat of important courts and public offices, and contains a university, removed from Abo in 1827. It has manufactures of linen, sail-cloth, and tobacco, an important trade in timber, corn, and fish, and one of the best harbors in the Baltic. Pop. (1910) 147,218.

Helsingör. See *Elsinore*.

Helst, BARTHOLOMEW VAN DER, a most distinguished Dutch portrait painter, born at Haarlem in 1611 or 1612. His picture of a banquet of a company of civic guard in the Stadthouse at Amsterdam was called by Sir Joshua Reynolds 'perhaps the first picture of portraits in the world.' He died at Amsterdam (where he had long resided) in 1670.

Helston (hel'stun), a borough of England, county of Cornwall, on an acclivity on the left bank of the Cober, 9 miles S. W. Falmouth. Principal industries, mining and shoemaking, and there is some shipping trade from Port Leven, 3 miles distant. Pop. 2938.

Helvellyn (hel-vel'lin), one of the highest mountains of England, county of Cumberland, between Keswick and Ambleside; height, 3313 feet.

Helvetian Republic (hel-vē'shun) the name given to the republic established in Switzerland by the French in 1798. See *Switzerland*.

Helvetic Confession (hel-vet'ik), the name of a document drawn up by Martin Bucer in 1536 to settle the controversy between the Lutherans and the Zwinglians; and also of one drawn up by Bullinger (1566) at the request of Friedrich III, elector of the Palatinate, and adopted in Switzerland, the Palatinate, France, Hungary, Poland, and Scotland.

Helvetii (hel-vē'shi), anciently a Gallic or Celtic nation, dwelling in the country now nearly corresponding with Switzerland. They were not much known to the Romans until the time of Julius Cæsar, who, as governor of Gaul, prevented their intended emigration, and after many bloody battles pressed them back within their frontiers. After their subjection by Cæsar several Roman colonies were established amongst them. On the death of Nero the Helvetii, for refusing to acknowledge Vitellius as emperor, were mercilessly punished by Cæcina, one of his generals, and thenceforth almost disappear as a people. From them Switzerland is often called Helvetia.

Helvétius (el-vā-si-ŭs), CLAUDE ADRIEN, a French philosophical writer, born in 1715. Having made a fortune as a farmer-general, he devoted himself to philosophic work. In 1758 he published his one important book, *De l'Esprit* ('On the Mind'), the materialism of which drew upon him many attacks. It was condemned by the Sorbonne, and publicly burned by decree of the Parliament of Paris. In 1764 he went to England, and the year afterwards to Germany, where Frederick the Great and

other German princes received hi with many proofs of esteem. He died 1771 in Paris. He also wrote a work, *De l'Homme*, and an allegorical poem, *Le Bonheur*.

Helvoetsluis (h e l' v u t-slois). See *Hellevoetsluis*.

Hemans (hem'anz), Felicia Dorothea, an English poetess, born at Liverpool in 1794; maiden name Brown. She first appeared as an authoress in 1808, with a volume entitled *Early Blossoms*, which was followed in 1812 by her more successful volume, *The Domestic Affections*. Later works were, *Lays of Many Lands*, *Songs of the Affections*, *Hymns for Childhood*, *National Lyrics*, etc. She died in 1835.

Hematin (hem'a-tin), or Hæmatin, the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

Hematite (hem'a-tīt), a name applied to two ores of iron, red hematite and brown hematite. They are both of a fibrous structure, and the fibers, though sometimes nearly parallel, usually diverge or even radiate from a center. They rarely occur amorphous, but almost always in concretions, reniform, globular, botryoidal, stalactitic, etc. The red hematite is a variety of the red oxide, and is one of the most important iron-ores. The brown hematite is a variety of the brown oxide or hydrate; its streak and powder are always of a brownish yellow. See *Iron*.

Hematoxylin. See *Hæmatoxylin*.

Hemeralopia (hem-er-a-lō'pi-a), a defect in the sight in consequence of which a person can see only by artificial light; day blindness. It is also used, however, for exactly the opposite defect of vision.

Hemerobiidæ (hem-er-o-bi'dē), the lace-wing flies, a family of neuropterous insects.

Hemerocallis (hem-er-o-kal'is), a genus of Liliaceæ. See *Day-lily*.

Hemidesmus (hem-i-des'mus), a genus of twining plants, nat. order Asclepiadaceæ, having opposite leaves, and cymes of small greenish flowers. *H. indicus* yields the Indian sarsaparilla, a reputed alterative, diuretic, and tonic, which is rarely employed in England.

Hemimetabola (-me-ta-bō'la), the section of the class Insecta which undergo an incomplete metamorphosis, the larva differing from the perfect insect chiefly in the absence of wings and in size.

Hemiopia (-ō'pi-a), a defect of vision in which the patient sees only a part of the object he looks at, the middle of it, its circumference, or its upper or lower part, or more commonly one lateral half being completely obscured. Also called *hemianopsia*.

Hemiplegia (-plē'ji-a), Hemiplegy, a paralysis affecting one-half of the body.

Hemipodius (-pō'di-us), a genus of rasorial birds allied to the quails. The swift-flying hemipodius is the little quail of New South Wales.

Hemiptera (he-mip'tėr-a), an order of four-winged insects, having a suctorial proboscis, the outer wings, or wing-covers, either entirely formed of a substance intermediate between the elytra of beetles and the ordinary membranous wings of most insects, or leathery at the base and transparent towards the tips (*hemelytra*). In one group (Aphides) all the wings when present are membranous. The true wings are straight and unplaited. Some feed on vegetable and some on animal juices. Those having the upper wings of a uniform substance throughout (whether leathery or transparent) have been constituted into a section, and by some naturalists into an order named Homoptera; those having them partly leathery and partly transparent constitute the section or order Heteroptera. To the Hemiptera belong the plant-lice, boat-fly, cochineal insect, locust, bug, lantern-fly, etc.

Hemisphere (hem'is-fēr), half a sphere, especially one of the halves into which the earth may be supposed to be divided. It is common to speak of the Eastern Hemisphere and the Western Hemisphere, the former, also called the Old World, comprising Europe, Asia, Africa, Australia, etc.; the latter, North and South America, etc. The boundary between the two is quite arbitrary, and a more natural division of the earth is into the northern and the southern hemisphere, the equator forming the dividing line.

Hemlock, or Hemlock Spruce, a name given to an American fir (*Abies Canadensis*) from its branches resembling in tenuity and position the common hemlock. The bark contains tannin and is largely used as a substitute for oak-bark in tanning leather. It forms great part of the forests of Canada and of the northern United States, extending northward to Hudson Bay. Its timber is not much esteemed,

as it splits obliquely and decays rapidly in the atmosphere.

Hemlock (hem-lok), a poisonous plant, *Conium maculatum*, nat. order Umbelliferæ, supposed to be identical with the plant *kōneion* of the Greeks. It is a tall, erect, branching biennial, with a smooth, shining, hollow stem, usually marked with purplish spots, elegant, much divided leaves, which when bruised emit a nauseous odor, and white flowers in compound umbels of ten or more rays, surrounded by a general involucre of three to seven leaflets. It is found throughout Europe and temperate Asia and in the United States, in waste places, banks, and under walls. It is said to be fatal to cows when they eat it, but that horses, goats, and sheep may feed upon it without danger. In the human subject it causes paralysis, convulsions, and death. The poison administered to Socrates is supposed to have been a decoction of it, though others are of opinion that the potion was obtained from water-hemlock (*Cicūta virōsa*). Hemlock is a powerful sedative, and is used medicinally. The alkaloid, coniine, is considered the best preparation. It is often serviceable as a substitute for, or an accompaniment to, opium.

Hemlock (*Conium maculatum*).

Hemorrhage (hem'u-rij), a flux of blood from the vessels containing it, whether from a rupture or any other cause. A hemorrhage from the lungs is called *hemoptysis;* from the urinary organs, *hematuria;* from the stomach, *hematemesis;* from the nose, *epistaxis;* the treatment of course varying with the cause and seat of the mischief.

Hemorrhoids (hem'u-roidz), signifying an affection of the rectum otherwise called *piles*. In general, hemorrhoids manifest themselves between the period of puberty and old age, although infants and aged people are not entirely exempt from attacks. In some cases they appear to be the effect of a certain hereditary disposition, but any circumstance which produces a tendency or stagnation of the blood at the extremity of the rectum is to be reckoned among the local causes. The accumulation of fecal matter in the intestines, efforts to expel urine, the obstruction of any of the viscera, especially of the liver, the frequent use of hot bathing, of drastic purges, long continuance in a sitting posture, riding on horseback, pregnancy—such are some of the ordinary causes of hemorrhoids. They are classified in several varieties as external, when apparent at the anus; internal, when concealed within the orifice; blind or open, regular or irregular, active or passive, periodical or anomalous, etc. The best mode of treatment is to recur to hygienic rather than medicinal influences. The subject should avoid violent exercise; the food should not be too stimulating or nutritious. Traveling, or an active life, should succeed to sedentary habits. Constipation should be remedied by laxatives or gentle purgatives. Anything which may be productive of a local heat should be avoided; as warm seats, soft beds, too much sleep. If the pain is considerable recourse should be had to sedatives, gentle bleeding, leeches. The use of suppositories containing drugs, such as tannic acid or extract of witch-hazel (hazeline), will be found very useful; in mild cases iodoform suppositories may be curative. If the disease appears under a more severe form a surgical operation may become necessary.

Hemp (*Cannābis sativa*), a plant, the only known species of the genus *Cannābis*, nat. order Cannabinaceæ. It is an annual herbaceous plant; the leaves are divided into five lanceolate and coarsely serrate leaflets; the male flowers, which are on separate stems, are green, resembling those of the hop; the female flowers are inconspicuous, and the fruit is a little hard capsule containing a single seed. It is a native of Western and Central Asia, but has long been naturalized in Brazil and tropical Africa, and is extensively cultivated in Italy and many other European countries, particularly Russia and Poland. The Indian variety, often known as *Cannābis Indica*, is the source of the narcotic drug variously known as *hashish*, *bhang*, or *ganjah*. The hemp fiber is tough and strong, and peculiarly adapted for weaving into coarse fabrics such as sailcloth, and for twisting into ropes and cables. Immense quantities are exported from Russia. The finer sorts are used for shirtings, sheetings, etc., which, though coarser than that made from flax, are very

Hemp (*Cannābis sativa*).

much stronger and equally susceptible of being bleached. The hemp of England is very superior, but the plant does not pay the farmer, and very little of it is grown. In some of the United States it is a crop of considerable importance. The seed must be sown thin, not more than 1 to 2 bushels to an acre. Small paths are often left open along the field lengthwise, at about 7 feet distance from each other, to allow the plucking of the male plants first, as the female require to remain standing a month longer to admit of the seed becoming ripe. But in some parts the whole crop is cut at once, plants for seed being separately cultivated. The plant being stripped of its leaves, and dried in the open air, may be stored, but when steeped green it turns out of a better color. The steeping takes from four to eleven days, and the operation is known to be completed by the inner *reed* or woody fiber separating easily from the fibers of the outer bark. When thoroughly steeped it is taken out of the water and spread out in rows on the grass to bleach. This takes three weeks or more, during which period it requires constant turning with a light, long pole. After drying it is scutched or broken by breaks and scutching-stocks, resembling those employed for flax. Beating is the next operation, which separates the 'boon' from the fiber. The hemp is now ready for being heckled, after which it may be spun. Hemp-seed is much used as food for cage-birds, and also yields an oil. Sisal hemp or (henequen) and Manila hemp are not true hemps.

Hemp-palm, a Chinese and Japanese species of palm (*Chamærops excelsa*), of the fibers of whose leaves cordage is made.

Hempstead, village of Nassau County, N. Y., on the south coast of Long Island, 20 miles E. of New York City, forms part of Hempstead town. Pop. 4964. Hempstead town contains East Rockaway, Freeport, Hempstead, Lawrence and Rockville Center, and part of Floral Park, all resorts. Pop. 44,297.

Hems, or Homs (Roman, *Emesa*), a town of Syria, 85 to 90 miles northeast of Damascus. It is fortified, and has an active trade. The plains of Hems were the scene of the defeat of Zenobia by Aurelian in 272 A. D.; and of the defeat of the forces of the Sultan of Turkey by Ibrahim Pasha in 1832. Pop. estimated 66,000.

Henbane (hen'bān), a plant of the genus *Hyoscyamus*, nat. order Solanaceæ. *H. niger*, a native of Europe and Northern Asia, is a coarse, erect biennial herb, found in waste ground and loose dry soil, having soft, clammy, hairy foliage of disagreeable odor, pale yellowish-brown flowers streaked with purple veins, and a five-toothed calyx. The expressed juice of the leaves and seeds is often used as a sedative, antispasmodic, and narcotic, having in many cases the great advantage over laudanum of not producing constipation. When taken in considerable quantity it proves quickly fatal to man and most animals, particularly to domestic fowls.

Henbane (*Hyoscyamus niger*).

Henderson, a city, county seat of Henderson County, Kentucky, on the Ohio River, about midway between Louisville, Ky., and Cairo, Ill. It is a large corn and tobacco market, with excellent shipping facilities, three railroads and the river. There are buggy and wagon factories, a cotton mill, furniture factory and other industries. The section is underlaid with a high grade of soft coal. Pop. 12,567.

Hendricks, Thomas A., Vice-President of the United States, was born in Muskingum County, Ohio, in 1819. He studied law and practiced in Indiana, serving from 1851 to 1869 in the Indiana Legislature and in both Houses of Congress. In 1872 was elected governor of Indiana. In 1876 and 1884 was a candidate for the Vice-Presidency. He lost the election in the former year, but was elected with Grover Cleveland in the latter year. He died in 1885.

Heney, Francis Joseph, lawyer, born at Lima, New York, in 1859. He graduated at the University of California and the Hastings Law School, was admitted to the bar in 1883, engaged in legal and other occupations in Arizona, and was attorney-general of Arizona, 1893-94. He removed to San Francisco in 1895, and was later chosen by Attorney-General Knox to conduct cases of fraudulent land dealings at Portland, Oregon. In these he secured the removal from office of United States Attorney John H. Hall for conspiracy, and the conviction for fraud of United States Senator Mitchell, George C. Brownell, and others. He served for a time as United States District Attorney for Oregon, and in 1906

began an investigation of the wholesale corruption then existing in San Francisco. He succeeded in proving great bribery and graft, in which a party leader named Reuf and Mayor Eugene Schmidt were deeply involved. During their trials Heney was shot by a saloonkeeper, but recovered and continued his cases.

Hengist (heng'gist), a prince of the Jutes. In 449 the Britons sued for aid from the Saxons against the inroads of the Scots and Picts. The Saxons under Hengist and Horsa accordingly landed at the mouth of the Thames, and defeated the northern tribes near Stamford in 450 A.D. Being reinforced from home they afterwards united with the Scots and Picts against the Britons, whom they ultimately dispossessed. Hengist founded the kingdom of Kent, established his residence in Canterbury, and died about the year 488.

Hengstenberg (h e n g' s t e n-burg), Ernst Wilhelm, a German divine and commentator, born in 1802; died in 1869. His influence as leader of the orthodox party was established by the publication of the *Evangelische Kirchenzeitung* (1827), of which he was editor. His works include a translation of Aristotle's *Metaphysics; Christology of the Old Testament*, and *Introduction to the Old Testament; Commentary on the Psalms, the Revelation of St. John; History of the Kingdom of God in the Old Testament*, etc.

Hen-harrier, a species of hawk of the genus *Circus*, *C. cyaneus*. See *Harrier*.

Henley, William Ernest, an English poet, born at Gloucester, England, 1849; died, 1903. With Robert Louis Stevenson he collaborated in a series of plays; also edited *The Magazine of Art*, *The Scots* (later *National*) *Observer*, *The New Review*, and other serials; two or three anthologies of lyrics, etc. His poetry is vigorous and vivid and shows a fondness for unrhymed lyrical measures and experiments in unusual rhymes. A collected edition of his poems appeared in 1898; but *For England's Sake* (1900) and *Hawthorn and Lavender* (1901) were later volumes.

Henley-on-Thames, a municipal borough of England, in Oxfordshire, on the left bank of the Thames, here crossed by a handsome bridge, 35 miles west of London. Pop. 6456.

Henna (hen'a), a shrub (*Lawsonia inermis*), nat. order Lythraceæ, bearing opposite entire leaves and numerous small white fragrant flowers disposed in terminal panicles. Externally it bears considerable resemblance to the European privet. It grows in moist situations throughout North Africa, Arabia, Persia, and the East Indies, and has acquired celebrity from being used by the inhabitants of those countries to dye yellow the nails of their fingers and the manes, hoofs, etc., of their horses.

Hennepin (hen'i-pin), Louis, French Franciscan missionary and explorer in America, born at Ath, Belgium, about 1640; died after 1701. He went to Canada in 1673 and in 1678 joined La Salle, then starting on his most famous expedition, and from Fort Crèvecœur (near the present Peoria, Ill.) was despatched, with two companions, to explore the Illinois to its mouth, and the upper Mississippi. On April 11, 1680, he was captured by a band of Sioux Indians, probably near the mouth of the Wisconsin River, and was adopted into the tribe; during his captivity visited, probably first of white men, the Falls of St. Anthony, and escaping returned to Fort Frontenac (1681). Soon afterward he returned to France, and in 1683 published his famous book *Description de la Louisiane*, (1683), *Nouvelle découverte d'un très grand pays* (1697), in which he claimed to have descended the Mississippi to its mouth (a claim since shown to be false), and *Nouveau voyage* (1698).

Henry I, of Germany, surnamed *The Fowler*, according to tradition because his election to the German empire was announced to him while fowling; born in 876; the son of Otho the Illustrious, duke of Saxony. Henry, on the death of his father, became duke of Saxony and Thuringia. He was elected emperor of Germany in 919, and was the true founder of the empire. By his prudence and activity Suabia and Bavaria were forced to tender allegiance, and Lorraine was reunited to the German Empire in 925. He was defeated, however, by the Hungarians, and forced to pay a yearly tribute to obtain a truce for nine years. He spent this period in developing a sound military organization, and turning his arms against various Slavonic tribes in the south, was everywhere victorious. At the end of the truce with the Hungarians he refused the tribute, and completely routed them in 933. Besides his military reforms he diminished the feudal privileges, and granted to the cities of the empire their first municipal charters. He died in 936.

Henry II, the Saint, Emperor of Germany, born in 972, was a son of Henry the Quarreler of Ba-

varia, and great-grandson of the Emperor Henry I. He inherited Bavaria in 995, and on the death of Otho III in 1002 laid claim and was elected to the empire. He had to proceed to Italy to assert his sovereignty there, the Lombard cities having chosen Harduin of Ivrea as their king. During his absence Boleslas of Poland extended his sway over the whole of Bohemia, but after repeated campaigns Henry succeeded in recovering Bohemia, and in 1018, in the Peace of Budissin (Bautzen), reduced him to complete subjection. In the midst of these campaigns against Boleslas he made another expedition into Italy (1013) against Harduin. On this occasion Henry was crowned emperor by Pope Benedict VIII. He made a third expedition into Italy in 1022 to aid Benedict against the Greeks. He died in 1024.

Henry III, Emperor of Germany, the second belonging to the house of the Salian Franks, son of the Emperor Conrad II, was born in 1017; chosen king in 1026; succeeded his father in the imperial dignity, in 1039. He weakened the power of the great feudal lords and forced the duke of Bohemia in 1042, and the king of Hungary in 1044, and again in 1047, to accept their dominions as imperial fiefs. His influence was also paramount in Italy, especially in Milan, and in the south, where the Normans in Apulia and Calabria paid him homage. In 1046 he deposed the rival popes Benedict IX, Sylvester III, and Gregory IV, and caused Suitger, bishop of Bamberg, to be elected in their stead as Clement II. His efforts to secure the permanence of the influence of the empire over the see of Rome were thwarted by Cardinal Hildebrand (Gregory VII). He died in 1055. His first wife was a daughter of Canute the Great of England.

Henry IV, Emperor of Germany, son of Henry III, was born in 1050, and at the death of his father was only five years old. His whole life was a series of troubles, partly of his own causing. His severe treatment of the Saxons led to a rising which was cruelly punished. His treatment of the conquered people was such that they complained to the pope, and Gregory VII (Hildebrand) accordingly summoned Henry, in 1076, to appear before him at Rome and answer the charges, at the same time forbidding the sale of ecclesiastical dignities. Henry not only disregarded the threat, but instigated the bishops, assembled by his order at Worms, to renounce their obedience to the pope. Gregory, however, pronounced sentence of excommunication against him, and Henry, finding himself deserted, was obliged to go to Italy and make a humiliating submission to the pope (1077). The influence which the pope gained by his victory produced a reaction; the Italian princes who had long been dissatisfied with Gregory, offered Henry their assistance. The German princes, however, at the instigation of the pope, elected Rudolph, duke of Suabia, king. Henry hastened back to Germany and overcame his rival, who lost his life in 1080. Gregory again excommunicated Henry; but at the Council of Brixen, in 1080, he was deposed by the German and Italian bishops as a heretic and a sorcerer, and Guibert, archbishop of Ravenna (Clement III) set up in his place. In 1084 Henry succeeded in establishing Clement at Rome, but was obliged to return to Germany to maintain his ground against two rivals who successively arose. In 1085 Henry was again obliged to cross the Alps in aid of his protégé Clement III. But the dissatisfaction against him in Germany had not subsided, and though he succeeded in crushing the rebellion of his eldest son, Conrad, who died deserted at Florence in 1101, his second son Henry made himself master of his father's person in 1105 by stratagem, and compelled him to abdicate the throne at Ingelheim. Henry IV ended his life and his sorrows in neglect at Liége in 1106.

Henry V, Emperor of Germany, the son and successor of Henry IV (see above), was born in 1081. On his ascension the question of investiture distracted the empire anew. Pope Pascal would confer the imperial crown only upon condition that the rights claimed by Gregory should be formally conceded. Henry therefore seized the pope at the altar, and imprisoned him until he yielded two months later, and crowned Henry in April, 1118. Disturbances, however, arose in Germany, especially with Lothaire of Saxony, and the pope, declaring that his peace with the emperor had been compulsory, fomented the strife. The war continued two years, and devastated Germany, and after a second expedition to Italy and excommunication by successive popes, Henry was compelled to yield in the matter of investiture, and in 1122 subscribed the Concordat of Worms. He died at Utrecht in 1125, and was the last of the Salic or Frankish family of emperors, which was succeeded by the Suabian house. He married Matilda, a daughter of Henry I of England.

Henry VI, Emperor of Germany, son of Frederick I and Beatrice of Burgundy, the third emperor of the house of Hohenstaufen, born in

1165, crowned king in 1169, succeeded his father as emperor in 1190. He kept Richard Cœur du Lion in prison, and obtained a large ransom for him. He died in 1197.

Henry VII, Emperor of Germany, born in 1262, was chosen emperor in 1308. Among the first acts of his reign were recognition of the independence of the Swiss cantons of Schwyz, Uri, and Unterwalden, and the granting of the kingdom of Bohemia to his son John. He compelled the Milanese to give him the iron crown of Lombardy, suppressed by force the revolt which then broke out in Upper Italy, captured part of Rome, which was in the hands of Neapolitan troops, and was crowned Roman Emperor by two cardinals. He died suddenly in 1313.

Henry II, King of France, born in 1519, succeeded his father, Francis I, in 1547. Throughout his reign his mistress, Diana of Poitiers, exercised an important influence over king and court. After a brief war with England for the recovery of Boulogne, a war of longer duration and more serious results originated in 1551 in disputes between Henry and the pope as to the duchies of Parma and Placentia, and continued to devastate Europe till the general peace of Câteau-Cambrésis, 1559. To confirm the peace Philip II, become a widower by the death of Mary of England, was to marry Elizabeth, Henry's eldest daughter by Catharine de Medici. In the course of a tourney held to celebrate the event, Henry was mortally wounded by a splinter from the lance of Lord Montgomery, captain of the Scottish guard. He was succeeded in 1559 by his eldest son, Francis II.

Henry III, King of France, third son of Henry II and Catharine de Medici, born in 1551; succeeded his brother, Charles IX, in 1574. In the previous year he had been chosen king of Poland, which he was obliged to quit secretly when called to the throne of France. In 1576, after a civil war, he granted to the Protestants the favorable edict of Beaulieu, but the concession led to the formation of the League, and Henry, to re-establish his authority, declared himself its head. Civil war, however, again broke out, and though hostilities were again put an end to by the Peace of Bergerac in 1577, they were renewed in 1580 until the Peace of Fleix (November, 1580). The death of his brother the Duc d'Anjou in 1584, which left Henry of Navarre, a Calvinist, heir-apparent to the throne, brought on another war, called the war of the Three Henries, the leading persons engaged in it besides the king being Henry of Guise, the real head of the League, and Henry of Navarre. In 1588 Henry of Guise expelled the king from his capital. An apparent reconciliation at Blois was followed by the assassination of the Guises, and Henry, finding himself everywhere opposed by the Catholic party, was compelled to ally himself with Henry of Navarre. The two princes advanced on Paris, but in 1589 Henry III was stabbed by Jacques Clement, a Dominican, and died next day. He was the last of the branch of Orléans-Angoulême of the stock of the Valois, and was succeeded by Henry of Navarre, the first of the house of Bourbon.

Henry IV, of France was the son of Anthony of Bourbon, Duke of Vendôme, and of Jeanne d'Albert, daughter of Henry, King of Navarre, and herself afterwards Queen of Navarre. He was born in December, 1553, at Pau. Educated by his mother in the Calvinistic faith, he early joined, at her wish, the Protestant army of France, and served under Admiral Coligny. In 1572 he married Margaret of Valois, sister of Charles IX, and after the massacre of St. Bartholomew, which took place during the marriage festivities, was forced to adopt the Catholic creed. In 1576 he escaped from Paris, retracted at Tours his enforced abjuration of Calvinism, put himself at the head of the Huguenots, and took a leading part in all the subsequent religious wars. On becoming presumptive heir to the crown in 1584 he was obliged to resort to arms to assert his claims. In 1587 he defeated the army of the League at Coutras, and after the death of Henry III gained the battles of Arques (1589) and Ivri (1590). He was obliged, however, to raise the siege of Paris; and convinced that a peaceful occupation of the throne was impossible without his professing the Catholic faith, he became nominally a Catholic in 1593. After his formal coronation in 1594 only three provinces held out against him—Burgundy, reduced by the victory of Fontaine-Française in 1595; Picardy, reduced by the capture of Amiens in 1596; and Brittany, which came into his hands by the submission of the Duke of Mercœur in the spring of 1598. The war against Spain was concluded in 1598 by the Peace of Vervins to the advantage of France. The same year was signallized by the granting of the edict of Nantes, which secured to the Protestants entire religious liberty. He made use of the tranquillity which followed to restore the internal prosperity of his kingdom, and particularly the wasted finances, in which he was successful with the aid

of his prime-minister Sully. At the instance of Sully Henry divorced Margaret of Valois, and in 1600 married Marie de Medici, niece of the Grand-duke of Tuscany, mother of Louis XIII. She was crowned at St. Denis in 1610, but on the following day Henry was stabbed by a fanatic named Ravaillac, while examining the preparations for the queen's entry into Paris. The great benefits which Henry IV bestowed upon France entitle him to the designation which he himself assumed at an assembly of the Notables at Rouen in 1596, the Regenerator of France (*Restaurateur de la France*).

Henry I, King of England, surnamed *Beauclerc* ('fine scholar'), youngest son of William the Conqueror, was born at Selby in Yorkshire, in 1068. He was hunting with William Rufus when that prince was killed, in 1100, and instantly riding to London, caused himself to be proclaimed king, to the prejudice of his elder brother Robert, then absent as a Crusader. He re-established by charter the laws of Edward the Confessor, recalled Anselm to the primacy, and married Matilda, daughter of Malcolm III of Scotland, thus conciliating in turn the people, the church, and the Scots. Robert landed an army, but was pacified with a pension, and the promise of succession in event of his brother's decease. Soon after, however, Henry invaded Normandy, took Robert prisoner in 1106, and reduced the duchy. He was successful also in the struggle with France. The last years of his reign were very troubled. In 1120 his only son William was drowned in returning from Normandy, where, three years later, a revolt occurred in favor of Robert's son. The Welsh also were a source of disturbance. Henry appointed as his heir his daughter Matilda or Maud, whom he had married first to the Emperor Henry V, and then to Geoffrey Plantagenet of Anjou. Henry died at Rouen in 1135, and was succeeded by Stephen.

Henry II, King of England, first of the Plantagenet line, born in Normandy in 1133, was son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I. He was invested with the duchy of Normandy, by the consent of his mother, in 1150; in 1151 he succeeded to Anjou and Maine, and by a marriage with Eleanor of Guienne gained Guienne and Poitou. In 1152 he invaded England, but a compromise was effected, by which Stephen was to retain the crown, and Henry to succeed at his death, which took place in 1154. The commencement of his reign was marked by the dismissal of the foreign mercenaries; and although involved with his brother Geoffrey, who attempted to seize Anjou and Maine, and in a temporary dispute with France, he reigned prosperously till the contest with Thomas Becket regarding the Constitutions of Clarendon. Although sufficiently submissive after Becket's death in the way of penance and expiation, Henry gave up only the article in the Constitutions of Clarendon which forbade appeals to the court of Rome in ecclesiastical cases. Before this matter was terminated, Henry, in 1171, completed the conquest of Ireland, a great part of which had been reduced by Richard de Clare, Earl of Pembroke, commonly known as Strongbow. Henry's last years were embittered by his sons, to whom he had assigned various territories. The eldest son, Henry, who had been not only declared heir to England, Normandy, Anjou, Maine, and Touraine, but actually crowned in his father's lifetime, was induced by the French monarch to demand of his father the immediate resignation either of the kingdom of England or of the dukedom of Normandy. Queen Eleanor excited her other sons, Richard and Geoffrey, to make similar claims; Louis and William of Scotland gave them support; and a general invasion of Henry's dominions was begun in 1173 by an attack on the frontiers of Normandy, and an invasion of England by the Scots, attended by considerable disturbance in England. Conciliating the church by his penance, Henry took prompt action; William of Scotland was captured, and an accommodation arrived at with Henry's sons. These, however, once more became turbulent, and though the deaths of Henry and Geoffrey reduced the number of centers of disturbance, the king was forced to accept humiliating terms from Richard and Philip of France. He died shortly after at Chinon in 1189. He ranks among the greatest English kings both in soldiership and statecraft. He partitioned England into four judiciary districts, and ap-

Henry II, from his tomb.

pointed itinerant justices to make regular excursions through them; revived trial by jury, discouraged that by combat, and demolished all the newly erected castles as 'dens of thieves.'

Henry III, King of England, son of John by Isabel of Angoulême; born at Winchester in 1207; succeeded his father in 1216. At the time of his accession the dauphin of France, Louis, at the head of a foreign army, supported by a faction of English nobles, had assumed the reins of government; but was compelled to quit the country by the Earl of Pembroke, who was guardian of the young king until 1219. As Henry approached manhood he displayed a character wholly unfit for his station. He discarded his most able minister Hubert de Burgh, and after 1230, when he received homage in Poitou and Gascony, began to bestow his chief favors upon foreigners. His marriage in 1236 with Eleanor of Provence, increased the dislike to him felt by his subjects, and although he received frequent grants of money from parliament, on condition of confirming the Great Charter, yet his conduct after each ratification was as arbitrary as before. At length the nobles rose in rebellion under Simon de Montfort, earl of Leicester and husband of the king's sister; and in 1258, at a parliament held at Oxford, known in history as the Mad Parliament, obliged the king to sign the body of resolutions known as the Provisions of Oxford. A feud arose, however between Montfort and Gloucester, and Henry recovered some of his power. War again broke out, and Louis was called in as arbitrator, but his award being favorable to the king, Leicester refused to submit to it. A battle was fought near Lewes, in which Henry was taken prisoner. A convention, called *the Mise of Lewes*, provided for the future settlement of the kingdom; and in 1265 the first genuine House of Commons was summoned. Leicester, however, was defeated and slain in the battle of Evesham (1265), and Henry was replaced upon the throne. He died in 1272. His son Edward I succeeded him.

Henry IV, King of England, first king of the house of Lancaster; born in 1367; eldest son of John of Gaunt, duke of Lancaster, fourth son of Edward III. His mother was heiress of Edmund, earl of Lancaster, second son of Henry III. In the reign of Richard II he was made earl of Derby and duke of Hereford, but having in 1398 preferred a charge of treason against Mowbray, duke of Norfolk, he was banished with his adversary. On the death of John of Gaunt in 1399 Richard withheld Henry's inheritance, and Henry, landing in England, gained possession of Richard's person. The deposition of Richard by parliament, and the election of Henry, was followed by the murder of the late king. A plot against the king in 1400 was discovered in time to prevent its success, and many executions of men of rank followed; but an insurrection in Wales under Owen Glendower proved more formidable. The Scots were decisively defeated by the Percies at Homildon, and their leader, the Earl of Douglas, was captured (1402). An order from Henry not to permit the ransom of that nobleman and other Scottish prisoners was regarded as an indignity by the Percies, who set Douglas free, made an alliance with him, and joined Glendower. The king met the insurgents at Shrewsbury (1403), the battle ending in the defeat and death of Percy. The Earl of Northumberland was pardoned, and but few victims were executed. A new insurrection, headed by the Earl of Nottingham and Scrope or Scroop, archbishop of York, broke out in 1405, but was suppressed by the king's third son, Prince John. The rest of this king's reign was comparatively untroubled. In 1405 James, son and heir to King Robert of Scotland, was captured at sea on his way to France, and was detained a prisoner in England. Henry died in 1413, and was succeeded by Henry V.

Henry V, King of England, born at Monmouth in 1388. On succeeding his father, Henry IV, in 1413, he showed a wisdom in marked contrast to a somewhat reckless youth. He restored their estates to the Percies, and liberated the Earl of March, but in other respects based his internal administration upon that of his father. The persecution of the Lollards is the chief blot upon the early part of his reign. The struggle in France between the factions of the dukes of Orleans and Burgundy afforded Henry a tempting opportunit for reviving the claims of his predeces rs to the French crown. He accordingly landed near Harfleur in August, 1415, and though its capture cost him more than half his army he decided to return to England by way of Calais. A large French army endeavored to intercept him at the plain of Agincourt, but was completely routed (October, 1415). A year later the French were defeated at sea by the Duke of Bedford. In 1417 the liberal grants of the Commons enabled Henry once more to invade Normandy with 25,000 men. The assassination of the Duke of Burgundy, which induced his son and successor to join Henry,

greatly added to his power, and the alliance was soon followed by the famous Treaty of Troyes (May 21, 1420), by which Henry engaged to marry the Princess Catharine, and to leave Charles VI in possession of the crown, on condition that it should go to Henry and his heirs at his decease. He returned in triumph to England, but on the defeat of his brother, the Duke of Clarence, in Normandy by the Earl of Buchan, he again set out for France, drove back the army of the dauphin, and entered Paris. A son was at this time born to him, and all his great projects seemed about to be realised when he died of fever at Vincennes in August, 1422, at the age of thirty-four, and in the tenth year of his reign. He was succeeded by his son Henry VI.

Henry VI, King of England, born at Windsor in 1421, was crowned at Westminster in 1429, at Paris in 1430. As he was an infant not nine months old at the death of his father Henry V, his uncle John, duke of Bedford, was appointed regent of France; and his uncle Humphrey, duke of Gloucester, made protector of the realm of England. A few weeks after Henry's succession Charles VI of France died, when, in accordance with the Treaty of Troyes, Henry was proclaimed king of France. The war which followed at first proved favorable to the English, but in the end, by the heroism of Joan of Arc, the death of the Duke of Bedford, and the defection of the Duke of Burgundy, resulted in the loss to the English of all their possessions in France except Calais. In April, 1445, Henry married Margaret of Anjou, daughter of René of Provence. Two years later Humphrey of Gloucester died, when the Earl of Suffolk acquired the chief power in the kingdom, but his government was very unpopular. The insurrection of Cade followed, and the Duke of York returning from Ireland, a great party was formed in his favor, and he was declared by Parliament protector of the kingdom, the imbecile Henry being by this time unable even to personate majesty. The appointment was annulled in the following year, the king having recovered his faculties. York retired to the north, and being joined by his adherents, marched upon London. He encountered and defeated the king's army at St. Albans (1455), the first battle of the thirty years' wars of the Roses. The king again becoming deranged, York was once more made protector. Four years of peace followed, but the struggle was soon renewed. The king's forces were beaten at Blore Heath and Northampton, and though they gained the Battle of Wakefield, at which York was killed, they were again defeated by his son Edward at Towton and Hexham. Henry was restored for a few months in 1471 by Warwick, 'the king-maker,' but the battles of Barnet and Tewkesbury proved the hopelessness of his cause, and he died, some say was murdered, a few days after the last battle, in May, 1471. He was a gentle, pious, well-intentioned, hopelessly incompetent king, whose best reputation is that of founder of Eton College and King's College, Cambridge.

Henry VII, King of England, first sovereign of the race of Tudor, born in 1456. He was the son of Edmund, earl of Richmond, son of Owen Tudor and Catharine of France, widow of Henry V. His mother, Margaret, was the only child of John, duke of Somerset, grandson of John of Gaunt. After the battle of Tewkesbury he was carried by his uncle, the Earl of Pembroke, to Brittany, and on the usurpation of Richard III was naturally turned to as the representative of the house of Lancaster. In 1485 he assembled a small body of troops in Brittany, and having landed at Milford Haven, defeated Richard at Bosworth, and was proclaimed king on the field of battle, his right being subsequently recognised by parliament. In 1486 he married Elizabeth, daughter of Edward IV and heiress of the house of York, and thus united the claims of the rival houses of York and Lancaster. The reign of Henry VII was troubled by repeated insurrections, of which the chief were that headed by Lord Lovel and the Staffords (1486), and the impostures of Lambert Simnel (1487) and Perkin Warbeck (1496-99). He brought about a match between the Infanta Catharine, daughter of Ferdinand of Aragon and of Isabella of Castile, and his eldest son Arthur; and on the death of the latter, in order to retain the dowry of this princess, he caused his remaining son Henry to marry the widow by papal dispensation, an event which, in the sequel, led to a separation from the see of Rome. He married his eldest daughter to James IV, king of Scotland, from which marriage there ultimately resulted the union of the two crowns. In his later years his avarice became increasingly marked, two exchequer judges, Empson and Dudley, being employed in all sorts of extortion and chicanery in order to gratify this passion. His reign, however, was in the main beneficent. Its freedom from wars permitted the development of the internal resources of the country. His policy of depressing the feudal nobility, which proportionably exalted the middle ranks, was highly salutary. For a time,

however, the power lost by the aristocracy gave an undue preponderance to that of the crown. Henry died at Richmond in 1509.

Henry VIII, King of England, son of the preceding, born in 1491, succeeded his father in 1509. He was soon prevailed upon to join in a league formed against Louis XII of France. Some campaigns in France followed, but the success of the English at the Battle of the Spurs (1513) was succeeded by no adequate result, the taking of Tournay being the only fruit of this expensive expedition. Meantime, more splendid success attended the English arms at home, James IV of Scotland being completely defeated and slain at Flodden Field (1513). Henry, however, granted peace to the Queen of Scotland, his sister, and established an influence which rendered his kingdom long secure on that side. Finding himself deluded by his allies, he soon after made peace with France, retaining Tournay and receiving a large sum of money. From 1515 until 1529 the government was practically in the hands of Wolsey, no parliament being summoned in that period until 1523. After the election of Charles V to the German Empire, both Charles and the French king, Francis I, sought the alliance of England. A friendly meeting took place between Henry and Francis at the Field of the Cloth of Gold (1520), but the interest of Charles preponderated, and Henry declared war against France, though with no important results. Now came the determination of the king to divorce his wife Catharine, who was older than he, had borne him no male heir, and had, moreover, been in the first place the wife of his elder brother. The last of these points was the alleged ground for seeking divorce, though Henry was probably influenced largely by his attachment to Anne Boleyn, one of the queen's maids of honor. Wolsey, for his own ends, had at first been active in promoting the divorce, but drew back and procrastinated when it became apparent that Anne Boleyn would be Catharine's successor. This delay cost Wolsey his power and the papacy its authority in England. Henry in disgust eagerly caught at the advice of Thomas Cranmer, afterwards Archbishop of Canterbury, to refer the case to the universities, from which he soon got the decision that he desired. In 1533 his marriage with Catharine was declared null and an anticipatory private marriage with Anne Boleyn declared lawful; and as these decisions were not recognized by the pope, two Acts of Parliament were obtained, one in 1534 setting aside the authority of the chief pontiff in England, the other in 1535 declaring Henry the protector of the English church. But although Henry discarded the authority of the Roman Church, he adhered to its theological tenets; and while, on the one hand, he executed Bishop Fisher and Sir Thomas More for refusing the oath of supremacy, he brought many of the reformers to the stake. Finding that the monks and friars in England were the most direct advocates of the papal authority, and a constant source of disaffection, he suppressed the monasteries by act of parliament, and thereby inflicted an incurable wound upon the Catholic religion in England. The fall of Anne Boleyn was, however, unfavorable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward in 1537 fulfilled his wish for a male heir. The death of the queen was followed in 1540 by Henry's marriage with Anne of Cleves, the negotiations of which were conducted by Cromwell. The king's dislike to his wife, which resulted in another divorce, became extended to the minister who had proposed the union, and Cromwell's disgrace and death soon followed. A marriage with Catharine Howard in 1541 proved no happier, and in 1542 she was executed on a charge of infidelity. In 1543 he married his sixth wife, Catharine Parr, a lady secretly inclined to the Reformation, who survived the king. In the meantime Scotland and France had renewed their alliance, and England became again involved in war. James V ravaged the borders, but was defeated at Solway Moss in 1542, and in 1544 Boulogne was captured, Henry having again allied himself with Charles V. Charles, however, soon withdrew, and Henry maintained the war alone until 1546. Disease now so much aggravated the natural violence of Henry that his oldest friends fell victims to his tyranny. The Duke of Norfolk was committed to the Tower, and his son the Earl of Surrey was executed. Henry died on January 28, 1547, and was succeeded by his son, Edward VI.

Henry, Joseph, physicist, was born at Albany, New York, in 1799. In 1826 he began a series of brilliant experiments in electricity, and is said to have invented the first machine moved by the agency of electro-magnetism. In 1832 he was called to fill the chair of natural philosophy at Princeton. In 1846 he was elected secretary and director of the Smithsonian Institution. His published papers, chiefly on the subjects of electricity and magnetism, include over 150 titles. He died in 1878.

Henry, MATTHEW, a celebrated English divine, was born in 1662; died in 1714.

Henry, O., pen-name of the American short-story writer, William Sydney Porter (*q. v.*).

Henry, PATRICK, orator, was born at Studley, Virginia, in 1736; died in 1799. Indolent in disposition, he tried several occupations unsuccessfully during youth, finally studying law and winning sudden distinction, in 1763, by his telling speech in a case against the clergy. His powers as an orator have never been surpassed. A remarkable speech made by him in 1765 in the House of Burgesses in Virginia led to active resistance to the Stamp Act, and its enforcement became impracticable. He was a delegate to the First Continental Congress, and in 1775 made his most famous speech before the Virginia Convention at Richmond. He was governor of Virginia 1776-79 and 1784-85, and in 1788 vigorously opposed the adoption of the Federal Constitution. He is looked upon as the most eloquent of Americans.

Henry the Lion, DUKE OF SAXONY, the most remarkable prince of Germany in the twelfth century, was born in 1129. He succeeded his father, Henry the Proud, in 1139, assuming the government of Saxony himself in 1146. At the diet of princes in Frankfort (1147) he demanded restitution of Bavaria, taken from his father by Conrad VII; but was worsted in the war which followed. It was restored to him, however, in 1154, after the death of Conrad, by the Emperor Frederick, Henry's cousin. His possessions then extended from the Baltic and the North Sea to the Adriatic, and he was successful in opposing the league formed against him at Merseburg in 1166. About two years afterwards he separated from his wife and married Matilda, daughter of Henry II of England. He then went on an expedition to the Holy Land, and during his absence his enemies, and even the emperor, made encroachments on his dominions. In 1174 he followed Frederick I on his fifth expedition to Italy, but left him at the siege of Alessandria. He was then put under the ban of the empire, and his dominions were given to other princes. Henry defended himself for a time successfully, but was at last obliged to take refuge in England. In 1182 he asked pardon of the emperor on his knees, and Frederick promised him his hereditary possessions, Brunswick and Lüneburg, on condition of his undergoing exile for three years. He therefore again went to England, but returned to Brunswick in 1184. In 1188 he was once more compelled to leave the country, and it was only in 1190, at the close of a year's fighting, that a reconciliation was finally effected. Henry died at Brunswick in 1195. He was much in advance of his age in fostering industry, science, commerce and the arts.

Henry the Navigator (*Don Henrique el Navegador*), fourth son of King John I of Portugal, born in 1394. In his youth he gave brilliant proofs of courage. When the Portuguese conquered Ceuta in 1415 Henry distinguished himself by his bravery, and was knighted by his father, after whose death he chose for his residence the city of Sagres, in Algarve, near Cape St. Vincent, and vigorously prosecuted the war against the Moors in Africa. He erected at Sagres an observatory and a school of navigation. From time to time he sent vessels on voyages to the coasts of Barbary and Guinea; resulting in the discovery of the islands of Puerto Santo and Madeira, and some years later of the Azores. In 1433 Gilianes, one of his navigators, safely doubled Cape Bojador, and other adventurers, pushing still further south, discovered Cape Blanco in 1441 and Cape Verd in 1445. A profitable commerce with the natives of West Africa was soon developed, and the Senegal and Gambia were partially explored. After acting as general against the Moors in 1458 Henry died at Sagres on the 13th of November, 1458. His efforts not only laid the foundations of the commerce and colonial possessions of Portugal, but gave a new direction to navigation and commercial enterprise.

Henryson (hen'ri-sun), ROBERT, a Scottish poet of the fifteenth century, born about 1425; died about 1506. He spent most of his life at Dunfermline, where he was schoolmaster. The *Testament of Cresseid*, his most important work, is a continuation of Chaucer's *Troilus and Creseide*, though with individual merit; and he was probably the author of the early Scottish pastoral, *Robin and Makyne*. Amongst his other works were a *Tale of Orpheus*, *The Moral Fables of Æsop*, in Scottish meter, and an allegorical ballad, *The Bludy Serk*.

Henty (hen'ti), GEORGE ALFRED, an English writer, born near Cambridge in 1832; died in 1902. He served for a time as war correspondent for London papers, and afterwards wrote a number of novels and a large number (over seventy) of books of historical fiction for boys.

Hepar Sulphuris (lit. 'liver of sulphur,' so

called from its brownish-green and liver-like appearance), a mixture of polysulphides of potassium with sulphate or thiosulphate of potash.

Hepatica (he-pat'i-ka), or LIVERWORTS, ranunculaceous plants belonging to the genus anemone.

Hepatitis (he-pa-tī'tēs), a disease consisting in inflammation of some part of the liver.

Hephæstion (he-fēs'ti-on), a noble Macedonian of Pella, the friend of Alexander the Great. He accompanied the king in his Asiatic campaigns, and died at Ecbatana (B.C. 325 or 324). Alexander had his body conveyed to Babylon, and erected a monument to him, costing 10,000 talents.

Hephæstus (he-fēs'tus), a god of the ancient Greeks, identified by the Romans with their Vulcanus. He presided over fire, and was the patron of all artists who worked in iron and metals. He fixed his residence in Lemnos, where he built himself a palace, and raised forges to work metals. The Cyclopes of Sicily were his workmen and attendants; and with him they fabricated not only the thunderbolts of Zeus, but also arms for the gods and the most celebrated heroes. His forges were supposed to be under Mount Ætna. Aphroditē (Venus) was the wife of Hephæstus.

Heppenheim (hep'en-hīm), an interesting old walled town of Germany in Hesse-Darmstadt, 16 miles south of Darmstadt. Pop. 6364.

Heptarchy (hep'tar-ki), the seven principal kingdoms into which England was divided in Anglo-Saxon times. The kingdoms were founded at different times, and at no one time were they all independent monarchies together. In 827 King Egbert of Wessex united the other kingdoms into one, and assumed the title of king of England. See *England*.

Heptateuch (hep'ta-tuk), a name sometimes given to the five books of Moses or Pentateuch, together with the books of Joshua and Judges.

Hera (hē'ra), an ancient Greek goddess, identified by the Romans with their Juno, the sister and wife of Zeus (Jupiter), and daughter of Kronos (Saturn) and Rhea. The poets represent Zeus as an unfaithful husband, and Hera as an obstinate and jealous wife, the result of which is frequent strife between them. She was worshipped in all Greece, but her principal seats were at Argos and at Samos. The companions of Hera were the Nymphs, Graces, and Hours. Iris was her particular servant. Among animals, the peacock, the goose, and the cuckoo were sacred to her. Her usual attribute is a royal diadem on her head. The festivals in her honor were called Herææ. The principals were those celebrated every fifth year at Argos, which city was considered to be especially under her protection.

Hera.—Antique statue

Heracles (her'a-klēs), called by the Romans *Hercules*, the most celebrated hero or semi-divine personage of Greek mythology, was the son of Zeus (Jupiter) by Alcmena, the wife of Amphitryon. He was brought up at Thebes, and before he had completed his eighth month strangled two snakes sent by the jealous Hera (Juno) to devour him. In youth he had several distinguished instructors, among them the Centaur Cheiron. Early in life he had, at the command of Zeus, to subject himself for twelve years to the will of Eurystheus, on the understanding that after he had acquitted himself of this duty he should be reckoned in the number of the gods. He therefore went to Mycenæ, and performed at the bidding of Eurystheus the tasks known as the *twelve labors of Heracles*. These were: (1) to kill a lion which ravaged the country near Mycenæ; (2) to destroy the Lernæan hydra; (3) to capture, alive and unhurt, a stag famous for its incredible swiftness, its golden horns, and brazen feet; (4) to capture alive a wild boar which ravaged the neighborhood of Erymanthus; (5) to clean the stables of Augeas, where 3000 oxen had been confined for many years; (6) to kill the birds which ravaged the country near the lake Stymphalus, in Arcadia, and ate human flesh; (7) to bring alive into Peloponnesus a prodigious wild bull, which laid waste the Island of Crete; (8) to obtain the mares of Diomedes, which fed upon human flesh; (9) to obtain from the queen of the Amazons a girdle which she had received from Ares (Mars); (10) to kill the monster Geryon, king of Gades, and bring to Argos his numerous flocks, which fed upon human flesh; (11) to obtain apples from the garden of the Hesperides; (12) the last and

most dangerous of all, to bring from the infernal regions the three-headed dog Cerberus. Besides these labors, he also achieved of his own accord others equally celebrated. Thus, he assisted the gods in their wars against the giants, and it was through him alone that Zeus obtained the victory. Having attempted to plunder the temple at Delphi, he became engaged in conflict with Apollo, and was punished by being sold to Omphalé, queen of Lydia, as a slave, who restored him to liberty and married him. Having later returned to Greece, he became the husband of De-

Hercules slaying the Hydra.—From sculpture at Florence.

janira, who unwittingly brought about his death by giving him a tunic poisoned with the blood of the Centaur Nessus, which she innocently believed would retain for her Heracles' love. The poison took effect whenever the garment was put on, and as the distemper was incurable, Heracles placed himself on a burning pile on the top of Mount Œta, was received up into heaven, and being there reconciled to Hera, received her daughter Hebe in marriage. In ancient works of art Heracles is generally represented naked, with strong and well-proportioned limbs; he is sometimes covered with the skin of the Nemæan lion, and holds a knotted club in his hand, on which he often leans. The principal ancient statue of him which remains is the *Farnese Hercules* at Rome, a work of the Athenian Glycon. The myth of Heracles is believed by many writers to represent the course of the sun through the twelve signs of the zodiac. His marriage with Hebe was explained even by the ancients as symbolic of the renewing of the sun's course after its completion.

Heracleum (her-a-klē'um), a genus of large umbelliferous herbs, the cow-parsnips, of which *H. Sphondylium* (common cow-parsnip or hog-weed) is very common in Britain in damp meadow ground and pastures. *H. giganteum* (the Siberian cow-parsnip) is often grown in shrubberies, reaching the height of 10 feet.

Heraclidæ (her-a-klī'dē), the descendants of Heracles, but more particularly those who, assisted by the Dorians, successfully asserted by arms their claim to the Peloponnesus, whence their ancestors had been driven by usurpers. See *Greece* (*History*).

Heraclitus (her-a-klī'tus), a Greek philosopher, born at Ephesus, who flourished about 513 B. C. He traveled in different countries, particularly in Africa. On his return to Ephesus he was offered the chief magistracy, but refused it. He is said to have latterly repaired to solitary mountains to live on roots and herbs; but, being attacked by a fatal disease, was obliged to return to the city, where he died soon afterwards, it is said in his sixtieth year. He left a work on Nature, in which he treats also of religion and politics. Some fragments only of this work remain. He is considered as belonging generally to the Ionic school of philosophers, though he differed from it in important particulars. He considered fire as the first principle of all things, describing it as an ethereal substance, 'self-kindled and self-extinguished,' from which the world is evolved (not made) by a natural operation. It is also a rational principle, and the source of the human soul. Phenomena exist in a constant state of flux, always tending to assume new forms, and finally returning again to their source.

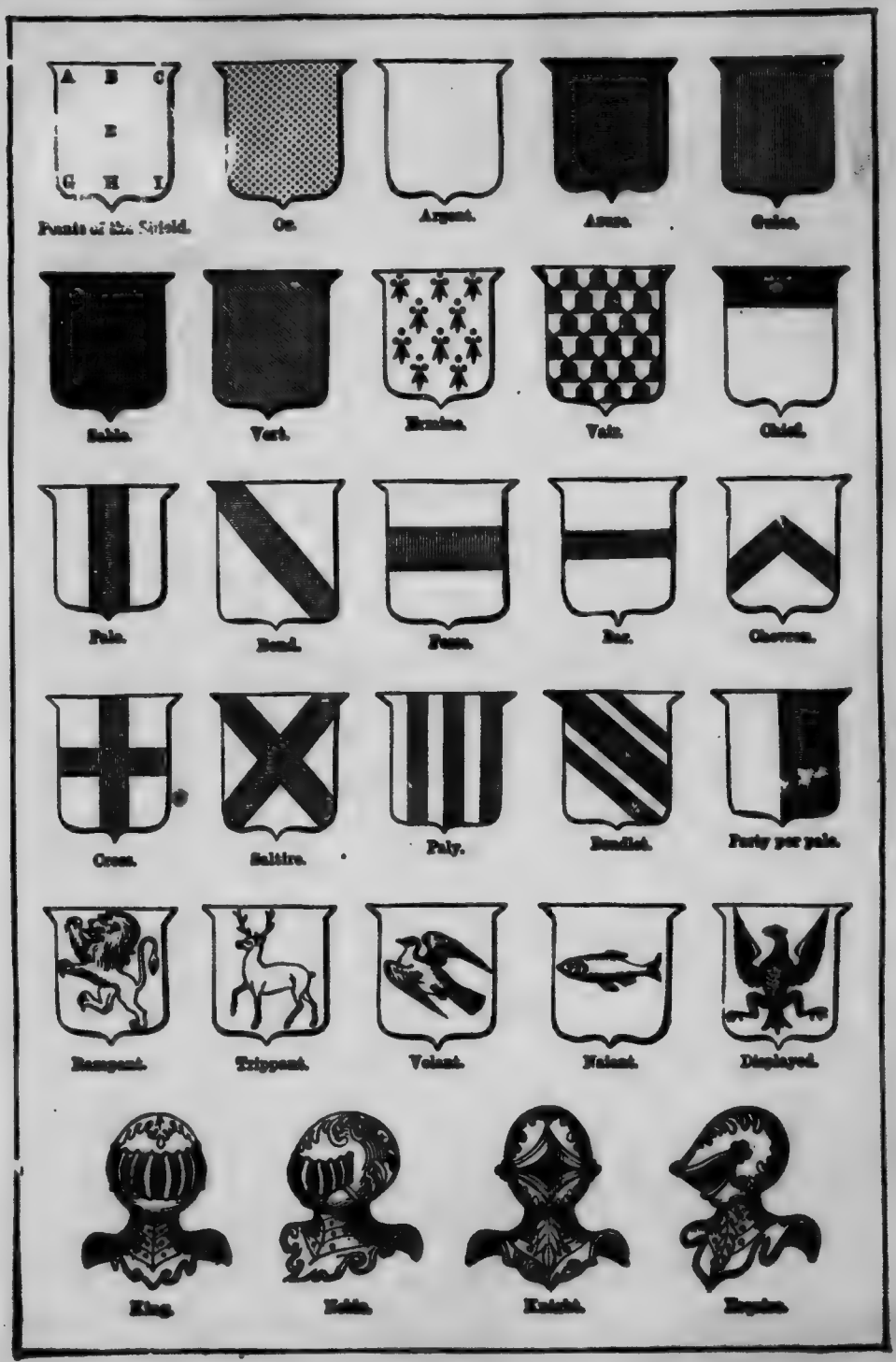
Heraclius (her-a-klī'us), Roman emperor of the East, born in Cappadocia about 575 A. D.; the son of Heraclius, exarch of Africa. At the head of a fleet from Carthage, in 610 he assisted in dethroning Phocas, the murderer and successor of the Emperor Mauritius, and himself ascended the throne. In a succession of splendid victories he crushed the Persians under Chosroes; but the energy of his earlier years seems to have worn itself out, and he made no effort to check the victorious progress of Mohammed. Before his death Syria, Palestine, Mesopotamia, and Egypt had fallen under the dominion of the caliphs. He died in 641, and was succeeded by his son, Constantine III.

Herald (her'ald), an officer whose functions originally were to carry messages of courtesy or defiance between sovereigns or persons of knightly rank, to superintend and register the results of trial by battle, tournaments, and

other chivalric exercises, to record the valiant deeds of combatants, proclaim war or peace, marshal processions and public ceremonials, and especially, in later times, to regulate and determine all matters connected with the use of armorial bearings. Heralds began to appear about the twelfth century, and assumed the functions which ultimately belonged to their office gradually. The herald, after the office was fully constituted, was created with many ceremonies, and had to pass through various grades of protracted service before reaching the full dignity of a herald. The office is now shorn of much of its importance. Heralds are appointed in England by the earl marshal, whose office is hereditary. The Heralds' College, or College of Arms, founded by charter of Richard III in 1483, consists of the three chief heralds (see *Garter King-of-Arms*), the six subordinate or provincial heralds of York, Lancaster, Chester, Windsor, Richmond, and Somerset; two heralds appointed on the accession of George I, called Hanover herald and Gloucester king-of-arms, together with the earl marshal and secretary, in all thirteen persons. There are four marshals or pursuivants, called blue-mantle, rouge-croix, rouge-dragon, and portcullis, who usually succeed to vacancies in the Heralds' College. Among the duties of the Heralds' College are the recording of pedigrees and the granting of coats of arms to persons who wish to assume them. The Heralds' College, or Lyon Court, in Scotland, consists of Lyon king-of-arms, and six heralds, with six pursuivants.

Herald-crab, a species of crab (*Huenia heraldica*), the carapace of which presents a fanciful resemblance to the shield and mantle figured by heraldic painters in depicting coat-armor.

Heraldry (her'ald-ri), the whole science of a herald's duties, or more commonly the knowledge of the forms, terms, and laws which pertain to the use of armorial bearings or coats of arms. Badges and emblems on shields, helms, banners, etc., naturally occurred in the earliest times, and the symbols were sometimes hereditary. The origin of heraldic arms, properly so called, is, however, to be attributed to the necessity which arose during the Crusades of distinguishing the leaders of the numerous and motley bands of warriors which constituted the Christian armies. One of the oldest specimens of heraldic bearings extant is the shield at Mans of Geoffrey Plantagenet, who died in 1150. Rolls of arms in England are extant from the reigns of Henry III, Edward I, and Edward II. The use of arms on the Great Seal of England was introduced by Richard I. The bearing of coat-armor by private persons was prohibited by proclamation in the reign of Henry V. The chief courts of jurisdiction in questions of heraldry are the Heralds' College in England, and the Lyon Court in Scotland. (See *Herald.*) The rules of heraldry now practised at the Heralds' College are comparatively modern, and differ in some respects from those of other European courts. A coat of arms consists of the figure of a shield marked and colored in a vast variety of ways, so as to be distinctive of an individual, a family, or a community. The shield or *escutcheon* represents the original shield used in war, and on which arms were anciently borne. The surface of the escutcheon is termed the *field*, and the several parts or *points* of it have particular names, so that the figures which the field contains may be precisely located. Color is given in the coat of arms by means of *tinctures*, two of which are *metals—or* and *argent*, that is, gold and silver—the rest *colors* proper. These colors are, in heraldic terminology: *azure*, blue; *gules*, red; *sable*, black; *vert*, green; *purpure*, purple; *tenney*, orange; *sanguine*, blood-color. The last two are comparatively uncommon. An object represented in its natural colors is said to be *proper*. When not given in colors or by actual gilding the tinctures are represented by points and lines in black and white. *Or* is distinguished by small dots covering the part; *argent* is represented by leaving the space blank; *azure* is shown by horizontal lines; *gules*, by perpendicular lines; *sable*, by perpendicular and horizontal lines crossing each other; *vert*, by diagonal lines running from the dexter chief to the sinister base; *purpure*, by diagonal lines running from the *sinister* chief to the *dexter* base. Another class of tinctures are the *furs*, of which the two principal are *ermine* and *vair*, and which have also their special method of representation. The figures borne on the shield may be either purely artificial and conventional, or may represent real objects, animals, plants, etc. Of the former the most common are known as *ordinaries* and have the following names: Chief, Pale, Bend, Fesse, Bar, Chevron, Cross, and Saltire. The *chief* is a portion of the shield at the top marked off by a horizontal line, and covers the upper third part of the field. The *pale* occupies the middle third part of the field perpendicularly. The *bend* is drawn diagonally from the dexter chief to the sinis-


A B C
E
G H I
Points of the Shield.
Or.
Argent.
Azure.
Gules.
Sable.
Vert.
Ermine.
Vair.
Chief.
Pale.
Bend.
Fesse.
Bar.
Chevron.
Cross.
Saltire.
Paly.
Bendlet.
Party per pale.
Rampant.
Trippant.
Volant.
Naiant.
Displayed.
King.
Noble.
Knight.
Esquire.

ter base in the form of a belt, and also occupies the third of the field. A diminutive of the bend is the *bendlet*. The *fesse* occupies the middle third of the field horizontally. The *bar* is formed after the manner of a fesse, but occupies only a fifth of the field, and is not confined to any particular part of it, except when there is only one bar, when it is put in the place of a fesse. Bars are mostly two in a field, sometimes three or more. A diminutive is the *barrulet*. The *chevron* may be regarded as made of a bend dexter and sinister issuing from the right and left base points of the escutcheon and meeting like two rafters. The *cross* is the ordinary cross of St. George. The *saltire* is the equally well-known cross of St. Andrew. The shield is often divided by lines running similarly to the ordinaries; hence when divided by a perpendicular line it is said to be *party per pale*, when by a horizontal line *party per fesse*, when by a diagonal line *party per bend*. Similarly, when it seems to bear several pales or bends or bars, it is said to be *paly*, *bendy*, or *barry* of so many pieces, 'paly of six argent and gules' for instance. *Charges* are the figures of natural and artificial things, and include animals and plants, implements and objects of all sorts, and various imaginary monsters, being drawn either on the field or on one of the ordinaries. It is a rule in heraldry that metal must not be put on metal nor color on color; hence, if the field say is *argent*, it cannot have a charge or an ordinary tinctured *or* directly upon it. Various technical terms describe the position of animals; thus, a lion is *rampant* when he is erect standing on one of his hind legs; *sejant*, when sitting; *couchant*, when lying at rest, with the head erect; *passant*, in a walking position; *gardant*, looking full-faced; *rampant gardant*, erect and looking full-faced; *salient*, in a leaping posture. So *trippant* is said of the stag when trotting; *lodged*, of the stag when at rest on the ground; *volant*, of birds in general in a flying posture; *rising*, of a bird that is preparing to fly; *displayed*, of birds seen frontwise with outspread wings; *naiant*, of fishes when swimming; and so on. The teeth and claws of lions and other ravenous beasts are called their *arms;* and when these have a special tincture the animal is said to be *armed* of such a tincture; similarly if their tongue be of a special tincture, they are said to be *langued* of this tincture. Often two or more coats of arms are united together on one shield, so that the whole may be a very complicated affair. The art of arranging arms in this way is known as *marshaling*, and when the shield is divided up into squares for the reception of different coats, it is said to be *quartered*. There are also certain exterior ornaments of the shield or escutcheon, namely, the helmet, mantling, crest, wreath, motto, and supporters. The helmet, which is placed on the top of the escutcheon, varies both in form and materials. Those of sovereign princes are of gold, those of the nobility of silver, and those of gentlemen of polished steel. The *full-faced helmet*, with six bars, is for the king and princes of the blood; the *sidelong helmet*, with five bars, is for dukes and marquises, etc.; the *full-faced helmet of steel*, with its beaver or vizor open, is for knights; and the *sidelong helmet*, with the vizor shut, for the esquire. The mantling or mantle was anciently fixed to the helmet, to which it served as a covering. Mantlings are now used like cloaks, to cover the whole achievement. The crest is placed above the helmet, with the wreath serving as a kind of support; the latter is composed of two colors wreathed or twisted together. The motto consists of the word or phrase carried in a scroll under or above the arms. Supporters were originally only ancient devices or badges, which by custom came to embellish armorial ensigns. They are called *supporters* because they hold the shield, as the lion and the unicorn in the well-known royal arms of England. The present royal arms of Britain exhibit the arms of England, Scotland, and Ireland in the four quarters of the shield; that is: Quarterly, 1 and 4, England; 2, Scotland; 3, Ireland. The arms of England are: Gules, three lions passant gardant in pale or; Scotland, or, a lion rampant within a double tressure flory counter-flory gules; Ireland, azure, a harp or, stringed argent.

Heralds' College. See *Herald*.

Herat (her-ät'), a city in the northwest of Afghanistan, in a beautiful and fertile plain, about 370 miles west of Cabul. It is inclosed by a broad deep moat, and an earthen mound surmounted by a lofty wall of unburned brick, and defended by a strong citadel. From each of four of the five gates a long street of bazaars (one vaulted throughout its entire length) leads towards a square in the center of the town. The remaining streets are narrow and dirty. The most important manufactures are carpets, sword-blades, shoes, cloaks, and sheepskin caps. The trade, almost entirely in the hands of Hindus, is greatly favored by the situation of the town on the great thorough-

fare from India westward. Herat was long the capital of the empire founded by Tamerlane. Pop. about 45,000.

Hérault (ā-rō), a department of France, on the Mediterranean coast; area, 2393 square miles. In the northwest it is covered by the Cevennes, but it descends rapidly towards the coast, which is lined by lagoons. The chief rivers, the Hérault, Orb, and Lez, are partly navigable; but the most important water communication is the Canal du Midi. The arable land, about one-sixth of the whole, is generally fertile. The vine and mulberrry are extensively, the olive more partially cultivated; fruit is abundant; and aromatic, medicinal, and dye plants are largely grown. Salt is obtained in large quantities. Capital, Montpellier. Pop. 488,285.

Herbaceous Plants (her-bā'shus), perennial plants of which the stem perishes annually, while the roots remain permanent and send forth a new stem in the following season.

Herbarium (her-bā'ri-um), or Hortus Siccus, a collection of dried plants systematically arranged. The specimens should be collected in dry weather, and carried home in a japanned tin-box or vasculum, a small pocket-box being desirable, however, for mosses and small plants. Very delicate specimens should be at once placed in a small field-book of unsized blotting-paper carried tightly strapped between suitable boards. At home they are carefully arranged upon bibulous paper, and pressed between smoothly planed deal boards either by putting weights upon the boards or by using a screw-press.

Herbart (her'bärt), Johann Friedrich, a German philosopher born at Oldenburg, 1776; died, 1841. In 1805 he was extraordinary professor of philosophy at Göttingen; in 1809 he went to Königsberg as Kant's successor; but in 1883 returned to Göttingen, where he remained till his death. Herbart starts from the Kantian position by analyzing experience. He posits a multiplicity of "reals," or things which possess in themselves absolute existence apart from appreciation by the mind of man. Ethics he ranks as that branch of esthetics which investigates the agreement or disagreement between volition and the fundamental moral ideas. His works on the science of education have been much studied.

Herb-bennet (that is, Saint Bennet or Benedict's herb), a plant, *Geum urbanum*, known also as Avens. It is aromatic, tonic, and astringent, and has been used in medicine, and as an ingredient in some ales.

Herb-Christopher, the bane-berry, *Actæa spicata*.

Herbert (her'bert), Edward, Lord Herbert of Cherbury, in Shropshire, an English writer, born in 1581, and educated at University College, Oxford. In 1609 he distinguished himself at the siege of Juliers under the Prince of Orange, and in 1614 served again in the Low Countries under the same leader. In 1618 he was sent ambassador to the court of France, but was recalled in consequence of a quarrel with Constable Luynes, the favorite of Louis XIII. On the death of Luynes, however, he was sent back to France as resident ambassador. At Paris, in 1624, he printed his famous book, *De Veritate*, with the object of asserting the sufficiency, universality, and perfection of natural religion. In 1625 he returned from France and was created an Irish peer, and in 1631 an English baron. He joined the parliamentary party, but subsequently quitted it, and suffered in fortune in consequence. He died in London in 1648. The character of Lord Herbert, as shown in his memoirs, was vain, punctilious, and quixotic, but open, generous, and brave. Another work of his was *De Religione Gentilium*. Soon after his death was published his *Life and Reign of Henry VIII*, and a collection of his poems was published in 1665.

Herbert, George, poet and divine, brother of Lord Herbert of Cherbury, born in 1593; was educated at Westminster and at Trinity College, Cambridge, of which he became a fellow in 1615. From 1619 till 1627 he was university orator. The death of James I in 1625 put an end to his prospects of civil promotion, and in the same year he took orders, and became a prebendary in the diocese of Lincoln. In 1630 he took priest's orders, and was presented to the rectory of Bemerton, near Salisbury, in Wiltshire. He died in 1633. His collection of religious poems, *The Temple*, was published in 1631, and the *Jacula Prudentum*, a collection of proverbs, in 1640. His poems bear the marks of an exceptionally fine nature, if not of genius, but they are marred by conceits and mannerisms. His chief prose work was *The Country Parson* (1652).

Herbert, Sidney, Lord Herbert of Lea, an English statesman, son of the eleventh Earl of Pembroke, was born in 1810. He was educated at Harrow and Oxford, and was Conservative member for South Wilts from 1832 till shortly before his death. He was secre-

tary to the admiralty under Peel in 1841, and in 1845 was made secretary for war, but became a convert to free-trade, and quitted office with Peel in 1846. From 1852 to 1855 he was war secretary in the Aberdeen cabinet, and in 1859 became again secretary of war. Early in 1861 he was transferred to the House of Lords, but died in the same year.

Herbert, VICTOR, an American musical conductor and composer, born in Dublin, Ireland, in 1859; received his musical education in Germany, devoting special study to the violoncello. He has held the appointment of soloist and conductor in several American orchestras; and since 1904 has conducted his own orchestra in New York. His compositions include orchestral compositions, songs, etc.; and a large number of light operas, including *Babes in Toyland*, and *The Spring Maid*.

Herculaneum (hêr-kū-lā'nē-um), an ancient city about 5 miles S. E. from Naples, completely buried with Pompeii, Stabiæ, etc., by lava and ashes during an eruption of Vesuvius in the reign of Titus, A. D. 79. The site had been long sought in vain, when in 1713 three statues were found in digging a well at the village of Portici. In 1738 the well was dug deeper, and traces of buildings were found. The theater was then discovered, but though the excavations were continued for many years it is now the only building to be seen underground, as the successive excavations were immediately filled up with rubbish from a new digging. A number of public buildings and private dwellings were laid bare, and many objects of great value discovered, such as statues, busts, beautiful mosaics, wall paintings, charred papyrus manuscripts, etc. One of the houses discovered contained a quantity of provisions, consisting of fruits, corn, oil, pease, lentils, pies, and hams. Few skeletons have been found either in Pompeii or Herculaneum, so that it is probable most of the inhabitants had time to save themselves by flight. Among the most interesting objects discovered here were the papyri, over 1750 of which are now in the Naples Museum, but hardly a third have yet been unrolled, the process presenting great difficulties from the tendency of the MSS. to crumble. The knowledge of ancient art has, however, gained more by the discoveries made here than literature. Recently a design of making a complete excavation of these ruins has been entertained, but as yet no work has been done.

Hercules (hêr'ku-lēs). See *Heracles*.

Hercules, one of Ptolemy's northern constellations, including 113 stars. The point to which the sun, with its accompanying system of planets, is traveling at present is situated in this constellation, which includes some remarkable star groups and nebulæ.

Hercules, PILLARS OF, the ancient name of the two promontories, Calpe (Gibraltar) and Abyla (Ceuta), at the entrance to the Mediterranean.

Hercules-beetle, a very large Brazilian lamellicorn beetle, *Scarabæus* or *Hynastes Hercules*. An enormous horn projects from the head, and a smaller one from the thorax, and the beetle attains a length of 5 inches.

Hercynian Forest (her-sin'i-an), the general name given by the ancients to the forest-clad mountains in Central Germany, extending from the Rhine to the Carpathians.

Herder (hêr'dêr), JOHANN GOTTFRIED VON, a German author, born in poor circumstances in 1744. He went in 1762 to Königsberg, procured an appointment in Frederick's College, and was permitted by Kant to hear all his lectures gratis. From 1764 to 1769 he was an assistant teacher at the cathedral school of Riga, with which office that of a preacher was connected, and it was during this period that he published his *Fragments on German Literature*. In 1769 he resigned his post in order to travel, and became traveling tutor to the Prince of Holstein-Oldenburg. But in Strasburg he was prevented from proceeding by a disease of the eyes; and here he became acquainted with Goethe, on whom he had a very decided influence. Besides his *Fragments*, his 'Critical Woods' (*Kritische Wälder*) and other productions had gained him a considerable reputation, and he was appointed in 1771 court preacher, superintendent, and consistorial counselor at Bückeburg, and in 1776 to the same offices at Weimar. In 1801 he was made president of the high consistory, a place before only given to noblemen. He was subsequently made a noble by the Elector of Bavaria. He died in 1803. As a theologian Herder contributed to a better understanding of the historical and antiquarian part of the Old Testament. His *Geist der Hebräischen Poesie* ('Spirit of Hebrew Poetry') is highly valued. He did much also for the better appreciation of the classical authors. His greatest work is his *Ideen zur Philosophie der Geschichte der Menschheit* ('Ideas on the Philosophy of the History of Man,' 1785 et seq.).

He also wrote some pleasing songs and translated the Spanish epic, *The Cid*.

Hereditaments (her-a-dit'a-ments), in law, any species of property that may descend to an heir. *Corporeal* hereditaments consist of material and tangible possessions, *incorporeal* hereditaments of rights and privileges not themselves tangible, though conferring claims on tangible possessions.

Hereditary Diseases. See *Disease*.

Heredity (hẽr-ed'i-ti), the transmission from parent to offspring of physical and intellectual characters. This has been at all times believed in, but it is only in recent times that the conviction has, in the hands of Darwin, Herbert Spencer, and Wallace, been methodised so as to embody an important zoological doctrine. The modern view of evolution in biology rests upon the belief that acquired peculiarities, or differences which may arise between parent and offspring, can be transmitted with some probability of permanence, especially if the variation presented by the young is determined by external conditions, or if it is such as to adapt the possessor more thoroughly to the conditions under which it is placed. On the other hand, while variations may be thus permanently transmitted by heredity, yet this very tendency of the young to repeat the characters of the parent is also a check on variability, or the tendency of structure and attributes to change with the environment. It may be noted that while the strong tendency to hereditary transmission works in the majority of cases so as to perpetuate those most fitted to survive, it secures the same result in other cases by a converse action. The question of the heredity of acquired characters, changes arising during the lifetime of an individual, has of late years been vigorously debated, without any definite conclusion. It is strongly maintained by many zoologists that such characters cannot be transmitted to offspring, but their arguments and evidences are not sufficient to convince the many who hold the opposite view, and the problem is still an open one.

Hereford (he're-ford), a city and parliamentary borough of England, capital of a county of the same name, on the left bank of the Wye. The principal streets are broad and straight; houses mostly of brick, and the public buildings of stone. The beautiful cathedral near the Wye was rebuilt, in the reign of William the Conqueror, on the site of an earlier edifice, and restored in 1863 under the direction of Sir G. G. Scott. Other public buildings are the college adjoining the cathedral, the shire-hall, the county-jail, free library and museum, corn exchange, market-hall, and post-office. The manufactures, which are inconsiderable, consist of gloves, leather, turnery, nails, etc. Hereford was long an important garrison town on the Welsh border, and was the last city to surrender to the parliamentarians. Pop. 22,568.—The county, which is entirely inland, and borders on Wales, has an area of 833 sq. miles, nearly the whole of which is arable, meadow, and pasture. The county belongs wholly to the basin of Severn, towards which river it has a general slope north to south, as indicated by the course of its rivers, the Wye and its affluents. The soil is in general fertile. Wheat is the principal crop, but barley, oats, beans, pease, hops, and turnips are also extensively cultivated. Orchards are numerous, and a large quantity of excellent cider is made. The Herefordshire cattle are held in high estimation for meat, though not good milkers. Horses are bred in considerable numbers. Oak timber is abundant, and forms, with oak-bark, an article of export. Pop. (1911) 114,269.

Heretic (hẽr'e-tik), one who embraces a heresy, that is, one who holds some theological doctrine which conflicts with the beliefs of the Catholic or universal church, but who, at the same time, calls himself a Christian. Many of the early Christians preserved their Jewish or Greek philosophical notions, and mingled them with the doctrines of Christianity. Even in the time of the apostles we find traces of the Gnostics, and subsequently a great variety of heretical sects or sectaries arose. Among the chief may be mentioned the Manichæans, Sabellians, Arians, Apollinarians, Nestorians, Monophysites, Pelagians, Monothelites, Paulicians, etc. Among religionists stigmatised as heretics in later times by the Roman Catholic Church, were the Waldenses, the Wicliffites, Hussites, Lutherans, and all Protestant sects and churches. Before Christianity was made the religion of the Roman state, nothing but excommunication was inflicted upon the heretic; but severe laws were passed soon after the conversion of the emperors. The code of Justinian contains many ordinances against heretics, and the canon law made it a duty to denounce them, under pain of excommunication. As early as 385 Priscillian was condemned to death as a heretic by the Spanish bishops at the Council of Trèves; but the persecutions of heretics, properly so called, began in the pontificate of Gregory VII, in

the eleventh century. Spain, Italy, and France, from the thirteenth to the sixteenth century, suffered much from these persecutions, but the states of Germany showed greater moderation. In England the burning of heretics was practiced before 1200, and long continued. Heresy is now left entirely to the cognizance of the ecclesiastical courts.

Herford (her'fort), a town of Prussia, in Westphalia, 16 miles southwest of Minden. It has manufactures of linen and cotton goods, leather, basket-work, and tobacco; oil mills, etc. Pop. (1910) 32,546.

Heriot (her'i-ot), in old English law, a tribute or fine, as the best beast or other chattel, payable to the lord of the fee on the decease of the owner, landholder, or vassal.

Heriot, GEORGE, founder of the hospital in Edinburgh which bears his name, and jeweler to King James VI, was born in 1563. He followed his father's profession, and was admitted a member of the Incorporation of Goldsmiths in 1588. In 1597 he was appointed goldsmith to the queen by James VI, and on the accession of the latter to the English crown followed the court to England. He died in 1624. He left nearly the whole of his fortune to found a hospital in Edinburgh for the maintenance and education of poor fatherless boys, freemen's sons, of the town. The present magnificent structure known as Heriot's Hospital was built between 1628 and 1659. See *Edinburgh*.

Herisau (hā'rē-sou), a town of Switzerland, in the canton and 4 miles northwest of Appenzell. It has manufactures of muslin and other kinds of cotton goods. Pop. 13,501.

Heristal. See *Herstal*.

Herkimer, a village, capital of Herkimer County, New York, on the Mohawk River, 14 miles E. of Utica. It has leather board, knitting, and furniture mills, and cheese is largely made in the vicinity. Pop. 8000.

Herkimer, NICHOLAS, soldier, born in New York about 1715, commanded at Fort Herkimer, New York, when attacked by Indians in 1758, and in 1777 led a militia force to relieve Fort Stanwix, then besieged by British and Indians. In an engagement at Oriskany he was mortally wounded.

Hermann (her'mān), JOHANN GOTTFRIED JAKOB, a German scholar, born in 1772. He began to lecture on ancient literature at Leipsig in 1794, and with this university he was connected till his death in 1848. Hermann originated valuable reforms in the method of Greek grammatical instruction; and he is especially known for his editions of Æschylus, Euripides, Aristophanes, Bion, and Moschus, and for the controversies in which his theories involved him with other scholars.

Hermannstadt (hēr'man-stat), a town of Transylvania, on the Cibin, 54 miles S. S. E. Klausenburg. It consists of a high and a low town, connected by steep stone stairs, and of three suburbs. The high town is double walled and well built. Its origin dates back to the 12th century, and it was once an important fortress. It is the seat of the governor of the province and of the Greek metropolitan of Transylvania. The manufactures are varied, and there is an important transit trade, chiefly to and from Constantinople Pop. (1910) 25,008.

Hermaphrodite (her-maf'rō-dīt), an animal in which the characteristics of both sexes are either really or apparently combined, especially an animal having the parts of generation both of male and female, so that reproduction can take place without the union of two individuals. Hermaphrodites are divided into true and spurious, the first exhibiting a real combination of the characteristics of the two sexes; while in the second the combination is only apparent. The animals in which the organs of the two sexes are normally combined in the same individual are confined to the invertebrate division of the animal kingdom, as for example certain groups of the inferior worms, molluscs, barnacles, etc. There are no real hermaphrodites in any of the higher species of animals.

Hermaphrodite Brig, a brig that is square-rigged forward and schooner-rigged aft.

Hermas (her'mas), one of the so-called apostolic fathers, generally supposed to be the person mentioned by that name in Rom., xvi, 14, though others maintain that he lived much later. He is known as the author of a work entitled the *Shepherd*, circulated at Rome early in the second century, and for which a place in the canon was even claimed. Only a few fragments exist of the Greek original, but the Latin translation, made at a very early period, appears to be complete. It is prized as a relic of the primitive church.

Hermeneutics (her-me-nū'tiks; from a Greek word meaning to explain or interpret), the science which fixes the principles of the interpretation of the sacred writings. Her-

meneutics bears the same relation to *exegesis* as *theory* to *practice*. See *Exegesis*.

Hermēs (her'mēz), called by the Romans *Mercurius* (see *Mercury*), in Greek mythology the son of Zeus and Maia, the daughter of Atlas. He was born in Arcadia, and soon after his birth left his cradle and invented the lyre by stringing the shell of a tortoise with three or seven strings. The lyre, however, he resigned to Apollo, with whom it was ever after identified. Hermēs also invented the Pandean pipe. The ancients represent Hermēs as the herald and messenger of the gods. He conducted the souls of the departed to the lower world. He was the ideal embodiment of grace, dignity, and persuasiveness, but also of prudence, cunning, fraud, perjury, theft, and robbery. His cunning was frequently of service both to the gods and the heroes, and even to Zeus himself. Later writers ascribe to him the invention of dice, music, geometry, letters, etc. He was worshipped in all the cities of Greece, but Arcadia was the chief place of his worship, his festivals being called *Hermæa*. In the monuments he is represented as in the flower of youth, or in the full power of early manhood. He often appears with small wings attached to his head and to his ankles. Among his symbols are the cock, the tortoise, a purse, etc., and especially his winged rod, the *caduceus*.

Hermēs.—Wall painting. Pompeii.

Hermes, Georg, a German theologian, born in 1775. He studied theology at the University of Münster; became teacher in the gymnasium of that city, and in 1807 professor of dogmatic theology in the university. When the Prussian government established the University of Bonn, Hermes was appointed to the chair of Catholic theology (1820). Here he distinguished himself by an ingenious effort to base the doctrines of the church on Kant's system of philosophy—an attempt known as Hermesianism. It aroused powerful opposition, being condemned as heretical by a papal letter of 1835, two years after the death of its originator.

Hermes Trismegis'tus, a mythical personage, the reputed author of a great variety of works, probably written by Egyptian Neo-Platonists, who ascribed the authorship of the highest attainments of the human mind to Thoth, the Egyptian Hermes; regarding him as the source of all knowledge and inventions, the *Logos* incarnate, thrice greatest (Gr. *tris megistos*). Clement of Alexandria mentions the contents of forty-two books of Hermes which were extant in his time. Of those which now remain the most important is the *Poimandrēs* or *Poimander*, a dialogue on nature, the creation, the deity, the soul, knowledge, and similar topics. Of the extant works none belongs, in all probability, to an earlier date than the fourth or perhaps the third century of our era.

Hermetic Art (her-met'ik), another name for *Alchemy* (which see).

Hermitage (her'mi-tij), one of the finest French wines, produced along the Rhône between Valance and Valière, in the *ci-devant* Dauphiny. It is of two kinds, red and white; the former is preferred.

Hermit-crab, family (Paguridæ) of a name common to well-known crustaceans. These crabs take possession of and occupy the cast-off univalve shells of various molluscs, carrying this habitation about with them, and changing it for a larger one as they increase in size.

Hermit-thrush, of which there are several varieties, known under the specific names *Turdus pallasi*, *Turdus manus*, and *Turdus unalascæ*, is found in nearly all parts of N. America. It is about 7½ in. long, with a white breast spotted with dark brown and an olive head and neck which shades into dull red towards the tail.

Hermits. See *Anchorites*.

Hermon (hèr'mon), a mountain of Syria, belonging to the Anti-Lebanon, about 9400 feet high.

Hermopolis. See *Syra*.

Hermosillo (hèr-mo-sil'yō), a city in the state of Sonora, Mexico, on the river Sonora, 84 miles north from the port of Guaymas, with which it has a large traffic. It has a mint, distilleries, and flour-mills. Pop. 17,618.

Hernandia (hèr-nan'di-a), a genus of large East Indian

trees, forming the nat. order Hernandiaceæ. They have alternate entire leaves and flowers arranged in axillary or terminal spikes or corymbs. *H. sonora*, or Jack-in-the-box, is so called from the noise made by the wind whistling through its persistent involucels. The fibrous roots chewed and applied to wounds caused by the Macassar poison form an effectual cure, and the juice of the leaves is a powerful depilatory. The wood is light: that of *H. Guianensis* takes fire so readily from a flint and steel that it is used in the same way as amadou.

Hernandia sonora (Jack-in-the-box).

Herne, JAMES A., actor and playwright, born at Troy, New York, in 1839; died in 1901. His plays include *Hearts of Oak*, *The Minute Men*, *Drifting Apart*, *Margaret Fleming*, and *Shore Acres*, the last-named the most popular.

Hernia (hėr'ni-a), in surgery, a tumor formed by the displacement of a soft part, which protrudes by a natural or accidental opening from the cavity in which it is contained. The brain, the heart, the lungs, and most of the abdominal viscera may become totally or partially displaced, and thus give rise to the formation of hernial tumors. But the term is ordinarily applied to abdominal hernia. Every part of the abdomen may become the seat of hernia, but it most commonly appears in the anterior and inferior region, which, being destitute in a great measure of muscular fibers, and containing the natural openings, offers less resistance to the displacement of the viscera. Most of the viscera, when displaced, push the peritoneum forward before them: this membrane thus forms an envelope of the hernia, which is called the *hernial sac*. The hernia itself is usually a loop of the small bowel, and though it has been pushed through the wall of the abdomen, forming a tumor under the skin, the fæces still pass along it. If the hernia can be returned to the abdomen, it is said to be reducible; if, from its size or other cause, it cannot be replaced, it is irreducible. A hernia is said to be strangulated when it is not only irreducible, but also subjected to a continual constriction, which interferes with the circulation through the blood-vessels of the part and the passage of the fæces. It may be rapidly fatal. Constriction may be produced by different causes, but generally occurs at the margins of the opening through which the hernia protrudes. As soon as a patient perceives that he is affected with a hernia he should have recourse to medical advice, for the disease is then in its most favorable state for treatment. The hernia when it is reduced must be prevented from recurring by the constant pressure of a pad or truss. An irreducible hernia must be supported with great care. All violent exercises, and excess in diet, must be avoided. The strangulated hernia requires prompt relief, and may necessitate an operation.

Hernösand (her'neu-sän), a seaport and cathedral town of Sweden, capital of Westernorrland, on the island of Hernö, in the Gulf of Bothnia, with a considerable shipping trade. Pop. 7890.

Hero (hē'rō), a Greek priestess of Aphroditē at Sestos, on the coast of Thrace, for love of whom Leander, a youth of Abydos, swam every night across the Hellespont, guided by a torch from her tower. He was at length drowned in the attempt and his body washed ashore, when Hero, overcome with anguish, threw herself from the tower on the corpse of her lover, and perished. There is a Greek poem by Musæus on this subject.

Hero (or ALEXANDRIA), one of the most distinguished Greek mathematicians and mechanists of ancient times, who flourished about B.C. 150-100. A common pneumatic toy, called Hero's fountain, is attributed to him, and he also invented the æolipile, a heliostat, etc.

Herod (her'od), called THE GREAT, King of the Jews, was a native of Ascalon, in Judea, where he was born about 74 B.C. He was the second son of Antipater the Idumean, who, being made procurator of Judea by Julius Cæsar, appointed Herod to the government of Galilee. He at first embraced the party of Brutus and Cassius, but after their death reconciled himself to Antony, by whose interest he was first named Tetrarch, and afterwards King of Judea. After the battle of Actium he successfully paid court to Augustus, who confirmed him in his kingdom. On all occasions his abilities as a politician and commander were conspicuous; but his passions were fierce and ungovernable, and his wife Mariamne, her brother, grandfather, and mother, and his own sons by her, were all put to death by him. He rebuilt the temple at Jerusalem with great magnificence, and erected a

stately theater and amphitheater in that city. He also rebuilt Samaria, which he called Sebaste, and constructed many strong fortresses throughout Judea, the principal termed Cæsarea, after the emperor. The birth of Jesus Christ is said to have taken place in the last year of the reign of Herod, viz., B.C. 4, the year also signalized by the massacre of the children of Bethlehem. Herod's policy and influence gave a great temporary splendor to the Jewish nation, but he was also the first to shake the foundation of the Jewish government, by dissolving the national council, and appointing the high priests and removing them at pleasure, without regard to the laws of succession.

Herod Agrippa I, son of Aristobulus by Berenice, daughter of Herod the Great. For his attachment to Caligula he was imprisoned by Tiberius, but on the accession of Caligula (A.D. 37) he received the government of part of Palestine, and subsequently all the dominions of Herod the Great. To please the Jews, with whom his rule was very popular, he caused St. James to be put to death, and imprisoned St. Peter. He died in the circumstances related in Acts xii, in A.D. 44.

Herod Agrippa II, son of the preceding, and last of the Herodian line. Being too young to govern, Judea was, on his father's death, reduced to a Roman province. He subsequently received the kingdom of Chalcis, and obtained the superintendency of the temple at Jerusalem. With his sister, Berenice, he heard the defence of Paul before Festus at Cæsarea. Being driven from Jerusalem by the revolt of the Jews, he joined Cestius, and later on Vespasian, and during the siege of Jerusalem was very serviceable to Titus. After its reduction (A.D. 70) he and Berenice (with whom he was suspected to have an incestuous intercourse) returned to Rome. He is supposed to have died there, A.D. 94.

Herod An'tipas, son of Herod the Great by his fifth wife, Cleopatra, was appointed tetrarch of Galilee on his death (B.C. 4). This was the Herod who put to death St. John the Baptist, at the request of his wife Herodias, John having reproached them for their incestuous union. Having visited Rome he was accused of having been concerned in the conspiracy of Sejanus, and was stripped of his dominions, and sent (A.D. 39) with his wife into exile at Lugdunum (Lyons), or, as some say, to Spain, where he died.

Herodiones (hĕr-od-i-ō'nes), the herons, a modern name for an order of birds including the herons proper, but also the bitterns, storks, spoon-bills, ibises, etc.

Herodotus (hĕr-od'o-tus), the oldest Greek historian whose works have come down to us, the 'father of history,' born at Halicarnassus, in Asia Minor, about B.C. 484. Before writing his history he traveled extensively, visiting the shores of the Hellespont and the Euxine, Scythia, Syria, Palestine, Babylon, and Ecbatana, Egypt as far as Elephantine or other parts of Northern Africa, everywhere investigating the manners, customs, and religion of the people, the history of the country, productions of the soil, etc. On returning home he found that Lygdamis had usurped the supreme authority in Halicarnassus, and put to death the noblest citizens, among others his uncle, the epic poet Panyasis, and Herodotus was forced to seek an asylum in the island of Samos. Having formed a conspiracy with several exiles he returned to Halicarnassus and drove out the usurper, but the nobles who had acted with him immediately formed an aristocracy more oppressive than the government of the banished tyrant, and Herodotus withdrew to the recently founded colony of Thurii, in Italy, where he seems to have spent most of his remaining life. Here, at an advanced age, we are told by Pliny, he wrote his immortal work, a statement strengthened by the fact that events are noticed in the body of the book which occurred so late as 409 B.C., while its abrupt ending proves almost beyond question that he was prevented by death from completing it. The history is divided into nine books, each bearing the name of a muse, and is written in the Ionic dialect. The object of the historian is to narrate the conflict between the Greeks and Persians, and he traces the enmity of the two races back to mythical times. Rapidly passing over the mythical period he comes to Crœsus, king of Lydia, of whom and of his kingdom he gives a comparatively full history. The conquest of Lydia by Cyrus induces him to relate the rise of the Persian monarchy and the subjugation of Asia Minor and Babylon. The history of Cambyses and his Egyptian expedition leads him to introduce the valuable details of the history, geography, and manners and customs of Egypt, which occupy the second book. The Scythian expedition of Darius causes the historian to treat of the Scythians and the north of Europe; and the subsequent extension of the Persian kingdom affords him the

opportunity for giving an account of Cyrene and Libya. In the meantime the revolt of the Ionians breaks out, which eventually brings on the conflict between Greece and Persia. An account of this outbreak and of the rise of Athens after the expulsion of the Peisistratidæ, is followed by what properly constitutes the principal part of the work, and the history of the Persian war now runs on in an uninterrupted stream until the taking of Sestos. There are English translations of his history by Beloe, Cary, and Rawlinson, the last being accompanied by important notes and dissertations.

Heroes (hē'rōz), a name applied by the Greeks to mythical personages who formed an intermediate link between men and gods. They were demigods, whose mortal nature only was destroyed by death, while the immortal ascended to the gods. The heroic age of Greece is considered to have terminated with the return of the Heraclidæ into the Peloponnesus (B.C. 1100.) There were six great heroic races, descended respectively from Prometheus and Deucalion, Inachus, Agenor, Danaus, Pelops or Tantalus, and Cecrops. Individual families, as, for instance, the *Æacidæ*, *Atridæ*, *Heraclidæ*, belong to one or another of these races. Great sacrifices were not offered to the heroes, as they were to the Olympian deities; but groves were consecrated to them, and libations poured out on their sepulchers.

Heroin, DIACETYLMORPHINE. An alkaloid obtained from morphine by acetylization. The process consists of heating pure morphine alkaloid with acetyl chloride, washing the product obtained with dilute sodium carbonate solution and then purifying it by crystallization from hot alcohol. It occurs as a white crystalline powder, has a bitter taste, and is odorless. It is soluble in about 1700 milliliters of water, 31 of alcohol, 1.4 of chloroform, and in 100 milliliters of ether at 25° Centigrade. Its melting point is about 172° Cent. It is used as a sedative in cough mixtures and to relieve nervous irritations and moderate pain. Its effects are less depressing than those of morphine, but its use may become habitual.

Hérold (ā-rōld), LOUIS JOSEPH FERDINAND, a French musical composer, born in 1791; died in 1833. He entered the conservatoire at Paris, afterwards studied at Rome, and became musical tutor to the daughters of Murat, king of Naples. His first successful opera was *Les Rosières*, produced in 1817. This was followed by, among other minor compositions, *Le Muletier* (1823), and *Marie* (1826). His chief works, however, are the famous *Zampa* (1821), and the *Pré aux Clercs* (1832).

Heron (hėr'un), the common name of birds of the genus *Ardea*, constituting with the bitterns the family Ardeidæ, type of what is now commonly regarded as a separate order of birds, the Herodiones. The herons are very numerous, and almost universally spread over the globe. They are distinguished by having a long bill cleft beneath the eyes, a compressed body, long slender legs naked above the tarsal joint, three toes in front, the two outer united by a membrane, and by moderate wings. The tail is short, rounded, and composed of ten or twelve feathers. The common heron (*Ardea cinerea*) is about 3 feet in length from the point of the bill to the end of the tail, builds its nest in high trees, many being sometimes on one tree. Its food consists of fish, frogs, molluscs, mice, moles, and similar small animals. It has an insatiable voracity, and digests its food with great rapidity. It haunts fresh-water streams, marshes, ponds, and lakes, as also the sea-shore. It was formerly in high esteem for the table, and, being remarkable for its directly ascending flight, was the special quarry pursued in falconry by the larger hawks. The great heron (*A. herodias*) is an inhabitant of America, and is called also great blue heron; the great white heron or egret (*A.* or *Herodias alba*) belongs to Europe; and the green heron (*A. virescens*), the flesh of which is much esteemed, is a native of North America.

Heron. See *Hero*.

Herpes (hėr'pēz), a skin disease which, in most of its forms, passes through a regular course of increase, maturation, decline, and termination, in from ten to fourteen days. It is characterized by vesicles which arise in distinct but irregular clusters, and commonly appear in quick succession, and near together, on an inflamed base; generally attended with heat, pain, and considerable constitutional disorder. The term includes shingles and the like. The name herpes is given from the tendency of the eruption to creep or spread from one part of the skin to another (Greek *herpein*, to creep).

Herpetology (hėr-pe-tol'ō-ji; from Gr. *herpeton*, a reptile), that department of natural history which treats of reptiles. See *Reptile*.

Herrera (ėr-rā'ra), FRANCESCO, one of the greatest painters of the Seville school, was born there about 1576; died at Madrid in 1656. He de-

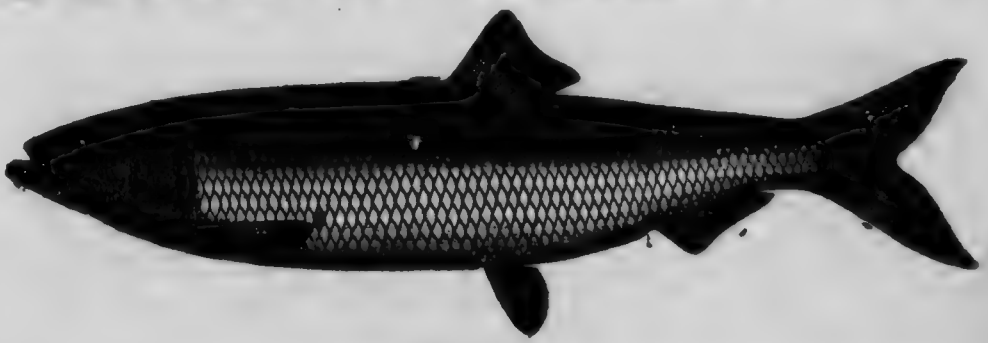
signed with spirit and vigor, and may justly be regarded as the founder of a new national school. His *Last Judgment* is a masterpiece of design and coloring. Equal praise is due to his *Holy Family* and the *Outpouring of the Holy Spirit*. He also displayed much skill in fresco painting and bronze work.—His youngest son, FRANCESCO, surnamed *El Moso*, was born in 1622; died in 1685. He gained a great reputation in oil-painting and fresco, and became principal painter to Philip IV.

Herrick (her'ik), ROBERT, an English poet, born at London in 1591; died about 1674. He was vicar of Dean Prior in Devonshire for about 20 years; suffered deprivation under the government of Cromwell; but recovered his benefice after the restoration of Charles II, in 1660. His compositions were published in 1648, under the title of *Hesperides, or the Works, both Humane and Divine, of Robert Herrick*. It is a delightful collection of love lyrics, epigrams, sketches of rural scenery, etc.

Herrick, ROBERT, born at Cambridge, Mass., in 1868; graduated from Harvard, 1890. Since 1893 he has been associated with the University of Chicago, and has been since 1905 professor of English. His works include *The Common Lot* (1904), *The Master of the Inn* (1908), *Together* (1908), *The Healer* (1911), *One Woman's Life* (1913), *His Great Adventure* (1913), etc.

Herrin, a city of Williamson County, Illinois, 10 miles N.W. of Marion. It has a powder plant, machine shops and foundry, and there are many coal mines in its vicinity. Pop. 9131.

Herring (her'ing), the general name of fishes of the genus *Clupĕa*, the most important of which is the *Clupĕa harengus*, or common herring. It is of wide distribution in the North Atlantic. It was formerly supposed that the herrings migrated in two great shoals every summer from the Polar Seas to the coasts of Europe and America, returning in the winter, but the migration is probably only from a deeper part of the ocean to a shallower. The feeding ground of the herring is probably the mud deposits found in the deeper parts of the sea, and it seems to be a fact that during their visits to the shallower waters of the coast for the purpose of spawning they do not feed, or feed very little. In summer the herring leaves the deep water where it has passed the winter and spring months, and seeks the coast where it may deposit its ova, and where they may be exposed to the influences of oxygen, heat, and sunlight, which are essential to their development. They are generally followed by multitudes of hakes, dog-fishes, etc., and gulls and other seabirds hover over the shoals. They swim near the surface, and are therefore easily taken by net. So great is their fecundity that the enormous number taken appears to produce no diminution of their abundance, as many as 68,000 eggs having been counted in the roe of one female. Herring, without any apparent cause, often desert parts of the coast where for a time they have been remarkably abundant, not returning, in similar plenty till after the lapse of a number of years. Such seems to be the case on our Eastern coasts. The common American species, *C. elongata*, differs somewhat in its external appearance from the common European species, *C. harengus*, above described. It varies in length from 12 to 15 inches; the color above is deep blue, tinged with yellow, with silvery sides and lower parts. Herring are full of roe in the end of June, and continue in season till the beginning of winter, when they deposit their spawn. The mode of fishing for herring is by drift-nets, very similar to those employed in the pilchard fisheries; the



Pacific Herring.

fishing is carried on only in the night, the most favorable time being when it is quite dark, and the surface of the water is ruffled by a breeze. The food of the herring is believed to consist chiefly of minute crustaceans and *scolecytra;* but it feeds also on small fishes, even the young of its own species. Other prominent members of the herring family (Clupeidæ) are the sprat or garvie (*Clupea sprattus*), the pilchard or gypsy herring (*C. pilchardus*), the whitebait, anchovy, etc. The alewife (*Caloes tyrannus*), a fish of the same genus as the shad, frequents the rivers of the Northern United States and Canada, and is popularly known as a herring. It is taken in large numbers, and is considered much superior to the common herring.

MOUNTAIN HERRING (*Coregonus Williamsoni*). Upper, mature fish. Lower, young fish. (From Bulletin 47, U. S. Nat. Museum.)

Herrnhut (hèrn'hŏt), a village of Saxony, 50 miles E. of Dresden. It was founded by Count Zinzendorf in 1722, for the Moravian Brethren, and it afterwards became the metropolis and center of that sect of Christians, who, from this town, are often called *Herrnhuters.* See *Moravian Brethren.*

Herschel (hèr'shel), CAROLINE LUCRETIA, sister of the astronomer Sir William Herschel, born at Hanover in 1750; died in 1848. She joined her brother at Bath in 1771, and acted during his life as his astronomical assistant. She also found time to conduct a series of observations of her own. Her observations were published by the Royal Society, of which she was made an honorary member. On her brother's death she returned to Hanover.

Herschel, SIR JOHN FREDERICK WILLIAM, only son of Sir William Herschel, was born in 1792 at Slough, near Windsor; died in 1871. In 1813 he was graduated B.A. at Cambridge, and was senior wrangler and Smith's prizeman. After his father's death he spent eight years reviewing the nebulæ and clusters of stars discovered by his father. The results were given in 1833 to the Royal Society in the form of a catalogue of stars. The catalogue contained observations on 525 nebulæ and clusters of stars not noticed by his father, and on a great number of double stars, between 3000 and 4000 in all. In 1830 he produced his excellent *Preliminary Discourse on the Study of Natural Philosophy,* and about the same time published several treatises in the *Encyclopædia Metropolitana, Lardner's Cyclopædia,* etc. In 1834 he established, at his own expense, an observatory at Feldhuysen, near Cape Town, his object being to discover whether the distribution of the stars in the southern hemisphere corresponded with the results of his father's labors in the north. He returned to England in 1838, and 1847 was published *Results of Astronomical Observations made during 1834-38 at the Cape of Good Hope, being the Completion of a Telescopic Survey of the Whole Surface of the Visible Heavens.* He was one of the earliest pioneers in photography; was made a D. C. L. of Oxford; and on the queen's coronation he was created a baronet. In 1848 he was president of the Royal Astronomical Society, and in 1850 was appointed Master of the Mint, an office which he resigned in 1855. Among Sir John's other works are *Outlines of Astronomy, Familiar Lectures on Scientific Subjects,* and a translation of the *Iliad* in verse.

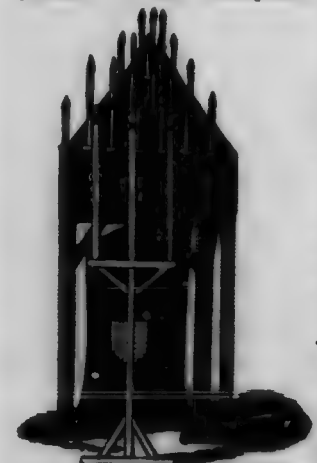
Herschel, SIR WILLIAM, astronomer, son of a musician of Hanover, born in 1738; died in 1822. He came to England in 1757, and was employed in the formation of a military band, and in conducting, while organist at Bath, several concerts, oratorios, etc. Although enthusiastically fond of music, he had for some time devoted his leisure hours to the study of mathematics and astronomy; and being dissatisfied with the only telescopes within his reach, he set about constructing instruments for himself. Late in 1779 he began a regular survey of the heavens, star by star, with a 7-foot reflector, and discovered March 13, 1781, a new primary planet, named by him the *Georgium Sidus,* but now known as *Uranus.* This discovery extended his fame throughout the world, and brought him a pension of £400 a year, with the title of private astronomer to the king. Assiduously continuing his observations, he measured the rotation of Saturn, discovered two of its satellites,

and observed the phenomena of its rings. He also discovered the satellites of Uranus, and observed the volcanic structure of the lunar mountains. At Slough, near Windsor, he erected a telescope of 40 feet length, and completed it in 1787. Herschel received much assistance in making and recording observations from his sister Caroline; and later his brother,

Sir William Herschel

a skillful optical instrument maker, lent him valuable aid. In 1802 he laid before the Royal Society a catalogue of 5000 nebulæ and clusters of stars which he had discovered. He was made D. C. L. by the University of Oxford, and in 1816 was knighted.

Herse, HEARSE (hėrs), a framework whereon lighted candles were placed at the obsequies of distinguished persons. The funeral herse of the middle ages was a temporary canopy covered with wax-lights, and set up in the church; the coffin was placed under the herse during the funeral ceremonies. Sometimes it was a very elaborate structure. The name has been transferred to the modern carriage for bearing a dead body to the grave.



Herse.—MS. in Bodleian Library.

Hersfeld (hėrs'fėlt), a town of Prussia, province of Hesse-Nassau, 10 miles N. N. E. of Fulda. Pop. (1905) 8088.

Herstal (hėrs'tăl), or HERMETAL, a town of Belgium, on the Meuse, 3 miles northeast of Liége. It was the residence of Pepin le Gros, and afterwards of several French kings of the second race; and has a church founded by Charlemagne. Pop. 20,114.

Hertford (hėrt'fėrd), an English town, capital of Hertford County, on the Lea, 21 miles north of London. It consists of three principal streets, meeting in a central square. There are breweries and oil and flour mills. Of the castle, which was built by Edward the Elder about 905, but a small portion remains. Pop. 10,384.—The county of HERTFORD (contracted HERTS) is bounded by Cambridgeshire, Essex, Middlesex, Buckingham, and Bedford; area, 636 sq. miles. Agriculture is the principal industry. Pop. (1911) 311,321.

Hertogenbosch. See *Bois-le-Duc.*

Hertz (hėrts), HENRIK, a Danish dramatic poet, was born at Copenhagen, of Jewish parents, in 1798; died in 1870. He wrote a great number of poems and novels, but his best works are his plays. Among the best known are *Svend Dyring's Huus*, a tragedy founded on an old saga, and *Kong René's Datter*.

Hertz, HEINRICH RUDOLF, German physicist, was born at Hamburg, Germany, in 1857; died in 1894. He studied at Berlin and in 1880 became assistant to Helmholtz. In 1885 he was called to the technical school at Karlsruhe, and in 1898 succeeded Clausius at Bonn. He greatly advanced the science of electricity, was the continuator of the work of Faraday and Clerk-Maxwell, and was a singularly ingenious experimenter. He demonstrated the existence of electromagnetic waves of comparatively slow frequency. The 'Hertzian' waves are propagated through space, and can be reflected, refracted, and polarized like light. Wireless telegraphy is the practical development of his discoveries. Hertz's discoveries rank with Faraday's discovery of the induction of currents, and he wrote valuable treatises on difficult problems in electricity and dynamics.

Heruli (hėr'ū-lī), an ancient Germanic people, originally found on the northern shores of the Black Sea. Under the leadership of Odoacer they helped in the overthrow of the Western Empire. About the end of the sixth century they ceased to have a separate existence as a people.

Hervey (her'vē), JAMES, an English divine, born in 1714; died 1758; was curate to his father and succeeded to the livings of Weston Favel and Collingtree. His works, which had a great popularity notwithstanding their turgid and meretricious style, include *Meditations among the Tombs; Reflections in a Flower Garden; Theron and Aspasio*, religious dialogues; and a volume of *Letters*.

Hervey Islands, a group of islands in the Pacific Ocean, S. W. of the Society Islands, lat. 20° S., lon. 160° W., consisting of nine islands, either volcanic or coraline, the largest being Raratonga. Pop. about 7000. Called also *Cook's Islands*.

Hervieu (ėr-vyē'), PAUL ERNEST, a French author and dramatist, born at Neuilly-sur-Seine, France, in 1857. He has written a number of novels and plays, and in 1900 was elected to the French Academy. His plays include *Les Tenailles, La loi de l'homme, L'énigme, Le Dédale, Le Reveil, Connais-toi, Bagatelle, Le Destin est Maître*.

Herzegovina (hert-se-go-vē'nȧ), a province of the Balkan peninsula, now under the Austrian sway, bounded on the N. by Croatia and Bosnia, on the E. by Novibazar, on the S. E. by Montenegro, and on the S. and W. by Dalmatia; area, 700 square miles. The surface is generally mountainous, but contains many fertile valleys. Pop. about 220,000. An insurrection which broke out in July, 1875, formed the beginning of a train of events resulting in war between Russia and Turkey. In accordance with the Treaty of Berlin (1878) the province was occupied by Austrian troops, and, in common with Bosnia, was governed by an Austrian military governor until 1908, when the two provinces were annexed to the Austrian empire.

Herzen (hert'sen), ALEXANDER, a Russian writer, born in 1812 at Moscow; died at Paris in 1870. While a student at Moscow he imbibed extreme philosophical and socialistic views, which brought about his imprisonment and exile. He was afterwards pardoned, but spent the latter part of his life (from 1847) abroad. Among his numerous works are the novels, *Who is to Blame?* and *Dr. Krupow; Letters from France and Italy; On the Development of Revolutionary Ideas in Russia; Recollections of my Lifetime; Memoirs of the Empress Catharine*, etc.

Herzog (hăr'zoh), JOHANN JAKOB, a German Protestant theologian, born at Basel in 1805; died at Erlangen in 1882. He was successively professor of historical theology at Lausanne, church history at Halle, and latterly at Erlangen. His chief works are *Calvin and Zwingli, Life of Œcolampedius and the Reformation in Basel*, and his great *Real-Encyklopädie für Protestantische Theologie und Kirche*, a vast collection of German learning and speculation, of which he was the editor, and to which he contributed over 500 articles.

Hesiod (hē'she-od), one of the oldest poets of Greece, belonging to the eighth century B.C. and connected with Ascra, a village of Bœotia, at the foot of Mount Helicon. Little is known of his life. Of numerous works attributed to him there remain only the *Theogony*, a collection of the oldest fables concerning the birth and achievements of the gods; the *Shield of Heracles*, a fragment of a larger work; and a didactic poem, *Works and Days*, which treats of agriculture, the choice of days, etc., with prudential precepts concerning education, domestic economy, etc.

Hesperides (hes-per'i-dēz), in Greek mythology, certain nymphs who lived in gardens, of rather uncertain locality, as guardians of the golden apples that grew there, being assisted in the charge by a dragon. Hesiod places the gardens in an island of the ocean far to the west. It was the eleventh labor of Heracles to kill the dragon and bring the golden apples of the Hesperides to Eurystheus.

Hesperornis (hes-per-or'nis), a fossil bird found in the chalk formation of Kansas, about 6 feet long, without wings, and having its jaws armed with teeth, which are not set in sockets, but in a common groove. It has been described as 'a kind of swimming, loon-like, raptorial ostrich, without fore-limbs, with the gape armed with formidable rows of strong teeth like a gigantic lizard, and with a large, broad, and flattened tail like a beaver.'

Hesperus (hes'per-us), among the ancient Greeks, a name of the evening star (the planet Venus).

Hesse (hes), or HESSEN, anciently a territory of Germany, situated mainly between the rivers Neckar, Rhine, Main, Lahn, and Fulda. After various fortunes it was ruled by the landgraf Philip I, who succeeded in 1509, and at his death in 1567 divided his dominions among his four sons. The death of two of these, however, reunited the territories in part, so that there remained only the two main divisions of Hesse-Cassel and Hesse-Darmstadt, the latter now known simply as Hesse. See following articles.

Hesse, or HESSEN, GRAND-DUCHY OF, formerly known as *Hessen-*

Darmstadt, an independent state of South Germany, consisting of sundry distinct portions. Of the two main portions, one (forming the provinces of Rheinhessen on the left, and Starkenburg on the right bank of the Rhine) lies immediately to the north of Baden, the other, Oberhessen (Upper Hesse), is entirely enclosed by the Prussian province of Hessen-Nassau; area of whole grand-duchy, 2964 sq. miles. Oberhessen is generally mountainous; the provinces Starkenburg and Rheinhessen are also mountainous towards their frontiers, more especially in the southeast, but there are also extensive plains belonging to the valleys of the Main and the Rhine. The climate is greatly diversified, being cold and bleak in the mountainous districts, and mild and pleasant in the valleys of the Rhine and the Main. Much of the soil, particularly in the provinces of Starkenburg and Rheinhessen, is remarkably fertile. The vine forms a most important object of culture, and fruit is very abundant. The principal towns are Darmstadt, the capital, Mainz, Giessen, Bingen, and Worms. About two-thirds of the inhabitants are Protestants. Pop. 1,119,893.—The Grand-duchy of Hesse originated in the division of the Landgraviate of Hesse in 1567. (See *Hesse*.) In 1806 the landgraviate was erected into a grand-duchy with an enlarged territory by Napoleon. It was reduced to its present limits in 1866, when it had to cede to Prussia some districts in the north, besides Hesse-Homburg, which, after being separated from it since 1596, had been reunited to it in the beginning of the year in which it was ceded. The reigning grand-duke, Ludwig (Louis), was married to Princess Alice of Great Britain.

Hesse-Cassel, or KURHESSEN ('Electoral Hessen'), a district of Germany, formerly an independent electorate, containing 4430 sq. miles, but now, with the exception of several small strips of territory, forming part of the Prussian province of Hessen-Nassau. It was founded in 1567. (See *Hesse*.) The last twenty years of its independent history is simply a narrative of conflicts between the people for political freedom and the elector for absolute rule. At last, on the outbreak of the German war of 1866, the elector declared himself on the side of Austria, and his territory was occupied by Prussian troops. On the conclusion of the war Hesse-Cassel was annexed to the Prussian territories as a conquered country.

Hesse-Darmstadt. *See Hesse, Grand-duchy of.*

Hesse-Homburg, before its absorption by Prussia after the German war of 1866, a landgraviate of Germany, consisting of two parts: the lordship of Homburg, situated N. N. W. of Frankfort, and the lordship of Meissenheim. It had an area of about 105 square miles, and a population of 27,000 inhabitants. The greater part of the public revenue was obtained from the gaming-tables of the watering-place, Homburg, the capital.

Hesse-Nassau, or HESSEN-NASSAU, a province of Prussia, formed out of the former Principality of Hesse-Cassel, the Duchy of Nassau, the Landgraviate of Hesse-Homburg, the territory and town of Frankfort, etc. It borders on the Prussian provinces of Westphalia, Hanover, Saxony, and the Rhineland, the Kingdom of Bavaria, etc., and encloses Upper Hesse. (See *Hesse, Grand-duchy of*.) The boundary is partly formed by the Rhine, Main, Weser, and Werra. Other rivers are the Lahn and Fulda. The greater part of this province belongs to the central German plateau, and has a rugged surface, partly covered by branches of the Harz. Still, about 40 per cent. of the whole is arable, while about the same is wooded. The chief mineral is iron. Mineral springs are numerous. The manufactures consist chiefly of woolens, cottons, and linen. The principal towns are Cassel, the capital, Wiesbaden, and Frankfort. Area, 6055 square miles. Pop. (1905) 2,070,052.

Hessian (hesh'an), a stout coarse cloth made of hemp.

Hessian Boots, a kind of high boots with tassel in front, worn over tight trousers, in fashion with military gentlemen in the eighteenth century.

Hessian Fly (*Cecidomyia destructor*), a fly of the family Tipulidæ, of the order Diptera (two-winged flies), the larva of which is very destructive to wheat, barley, and rye crops (it does not attack oats). It is so named from the unfounded belief, prevalent in America, where it is specially destructive, that it was brought over to that country in the baggage of the Hessian mercenaries employed against the Americans in the war for independence. The female fly is about the eighth of an inch in length, with a wing expanse of about a quarter of an inch. Its body is brown, with the upper parts, the thorax, and the head of a darker shade, approaching to black. The wings are of a dusky gray, and are surrounded with fringes. The male is somewhat smaller than the female and has longer antennæ. The

female flies usually lay their eggs on the young plants twice in the year, in May and September, out of which eggs the maggots hatch in from four to fourteen days. These work themselves in between the leaf-sheath and the stem, and fix themselves near the lowest joints, often near the root, and suck the juices

Hessian Fly (*Cecidomyia destructor*).
a, Male (natural size). *b*, Male (magnified).
c, Pupæ fixed on the joint of the wheat-stalk.

of the stem, so that the ear falls down at a sharp angle. These maggots turn to pupæ, from which the flies develop in about ten days. It has long been a pest in America and Germany, but did not appear in Britain till the summer of 1886.

Hessians. In 1775, during the Revolutionary War in America, the British king called for volunteers to put down the rebellion. As these came but slowly, he hired mercenary troops from the German states, obtaining nearly 30,000 in all. As many of these came from Hesse-Cassel the general term of 'Hessians' was applied to them. Some of them, taken prisoners, settled in the United States after the war.

Hestia (hes'ti-a), one of the later Greek goddesses, equivalent of the Latin Vesta.

Heteral'ocha. See *Huia-bird*.

Heterocercal (het-e-ro-sèr'kal), a term applied to ganoid and elasmobranchiate fishes, in which the vertebral column runs to a point in the upper lobe of the tail, as in the sharks and sturgeons.

Heteropoda (het-er-op'o-da), an order of marine molluscs, the most highly organized of the Gasteropoda. In this order the foot is compressed into a vertical muscular lamina, serving for a fin, and the gills, when present, are collected into a mass on the hinder part of the back. The chief genera are *Carinaria* and *Firola*.

Heteroptera (het-er-op'tĕr-a; Gr. *hetĕros*, different, and *pteron*, a wing), a section of hemipterous insects comprising those in which the two pairs of wings are of different consistence, the anterior part being horny or leathery, but generally tipped with membrane. They comprise the land and water bugs. By some naturalists the Heteroptera are separated from the Homoptera (the other section of the Hemiptera), and raised into a distinct order.

Heteroptera.
a, the Scutellum; *b*, Hemelytra.

Hetman (het'man), or Ataman, the title of the head (general) of the Cossacks. This dignity was abolished among the Cossacks of the Ukraine by Catharine the Great, and although the Cossacks of the Don still retain their hetman, the former freedom of election is gone, and the title of chief hetman is now held by the Russian heir-apparent to the crown.

Heuglin (hoi'glin), Theodor, Baron von, a German traveler, born in 1824; died in 1876. He first became known by his travels in the region of the White Nile and Abyssinia (1854); took part in the German expedition of 1861-62 to the Egyptian Soudan; and afterwards accompanied Mdme. Tinné in her expedition to the Upper Nile. In 1870-71 he made a journey to the region of Spitzbergen and Nova Zembla, and in 1875 a last journey to the shores of the Red Sea. He published several volumes of African travel and natural history.

Heureaux (hū-rō'), Ulysses, President of San Domingo, born at Porto Plata, in 1846. He engaged in the war against Spain, was elected president in 1882 and twice re-elected, and after two unsuccessful efforts to assassinate him, he was killed in a third attempt, in 1899.

Hewlett (hū'let), Maurice Henry, an English novelist, born in 1861. His best known book is *The Forest Lovers*, a work of much merit, which was awarded an Academy prize in 1899. Others are *A Masque of Dead Florentines*, and *Songs and Meditations*.

Hexachord (heks'a-kord), in the ancient music, an interval of four tones and one semitone, equivalent to that which the moderns call a *sixth*.

Hexagon (heks'a-gon), a plane figure of six sides and six angles. When these lines are equal the figure is called a *regular hexagon*.

Hexahedron (heks'a-hē'dron), a figure having six faces, or a solid bounded by six planes. The term cube is now generally applied to the *regular hexahedron*.

Hexameter (heks-am'e-tėr), a verse of six feet, the heroic or epic measure of the Greeks and Romans. The sixth foot is always a spondee (two long syllables) or a trochee (a long and a short). The first five may be all dactyls (two short syllables and one long), or all spondees, or a mixture of both. The scheme of this verse then is—

—⏑⏑|—⏑⏑|—⏑⏑|—⏑⏑|—⏑⏑|——
or,——|——|——|——|——|——⏑

with all the varieties which the mingling of the two kinds of feet afford. In modern poetry the hexameter has been frequently used. In English hexameters accent is almost entirely substituted for length, and trochees generally take the place of spondees. Longfellow in his *Evangeline*, Kingsley in his *Andromeda*, and Clough in his *Bothie*, have adopted this form of verse. The following lines are specimens of Clough's English hexameters:—

O let us | try, he | answered, the | waters them | selves will sup | port us, |
Yea very | ripples and | waves will | form to a | boat under | neath us.

Hexandria (heks-an'dri-a), in the Linnæan system of botany, a class of plants having six stamens, which are all of equal or nearly equal length.

Hexapla (heks'a-pla; Greek, *hexapla*, 'six-fold'), a collection of the Holy Scriptures in six languages; applied particularly to the combination of six versions published by Origen, containing the Hebrew text with a transcript of it in Greek characters, the Septuagint, and three other versions, those, namely, of Aquila, Symmachus, and Theodotion. It is only extant in fragments.

Hexastyle (heks'a-stil), in architecture, a term applied to a portico or temple which has six columns in front.

Hexham (heks'am), a town of England, in Northumberlandshire, on the Tyne, about 20 miles west from Newcastle. There are here ruins of an abbey church, originally a cruciform structure, built about 674, destroyed two centuries later by the Danes, renovated in 1113, and demolished by the Scots in 1296. Hats, gloves, and leather are manufactured, but the industries are chiefly agricultural. Pop. 8417. The BATTLE OF HEXAM, fought 15th May, 1464, was one of those belonging to the wars of the Roses. The Lancastrians under Somerset were defeated by Montagu.

Heydeck (hī'dek), KARL WILHELM VON, sometimes called *Heidegger*), a Bavarian landscape painter, born at Saaralben, in Lorraine, in 1788; died at Munich in 1861. He entered the military academy at Munich in 1801, and rose to the rank of lieutenant-general.

Heylin (hā'lin), PETER, an English theologian, born in 1600; died in 1662. He published his *Microcosmos, or Description of the Globe*, in 1625. In 1629 he became chaplain to Charles I, and obtained several benefices, from which he was ejected during the civil war. At the Restoration he was made subdean of Westminster. He wrote a *Life of Laud*, *A Defense of the Church of England*, and several theological works.

Heyne (hī'nė), CHRISTIAN GOTTLOB, an eminent German scholar and critic, born 1729; died 1812. He was educated at Chemnitz and at Leipsig University, and after a long struggle with poverty he received, in 1763, an invitation to become professor of eloquence and poetry at Göttingen. He was soon after (1764) appointed first librarian, and remained here till his death. He particularly applied himself to classical criticism and the illustration of the writings of the ancients, and published valuable editions of Homer, Pindar, Diodorus Siculus, Epictetus, Virgil, Tibullus, etc.

Heyse (hī'zė), PAUL JOHANN LUDWIG, a German novelist and dramatist, born at Berlin in 1830; settled at Munich in 1854. He wrote many plays, and short stories; but his fame rests on his great novels, including *Die Kinder der Welt* ('The Children of the World'), and *Im Paradiese* ('The Paradise Club'), generally recognised as among the most powerful and artistic works of modern German fiction. He died April 2, 1914.

Heyward (hā'ward), THOMAS, signer of the Declaration of Independence, born in St. Luke's parish, S. C., in 1746; died there 1809; member of the first General Assembly of South Carolina after the flight of the royal governor; of the committee of safety; a delegate to Congress 1775–1778; was in active military service in South Carolina, where he was wounded in 1780.

Heywood (hā'wud), a municipal borough of England, in Lancashire, about 8 miles northwest of Man-

chester. The making of power-looms, iron and brass founding, boiler-making, and all branches of cotton spinning and manufacturing, are extensively carried on. Pop. (1911) 26,698.

Heywood, JOHN, an early English dramatist, lived in the first half of the sixteenth century, and died at Mechlin about 1565. Sir Thomas More introduced him at the court of Henry VIII, with whom he became a favorite. His zealous attachment to the Roman Church recommended him to Queen Mary; but this very circumstance rendered him an object of suspicion during the two succeeding reigns, and he found it expedient to retire to the Continent. Heywood's dramatic works may be classed as *Interludes*, as they stand between the miracle-plays and the drama proper. Among them are: *A Mery Play between the Pardoner and the Frere, the Curate and Neybour Pratte; A Parable of the Spider and the Fly; the Four P's;* etc.

Heywood, THOMAS, dramatist, lived in the reigns of Elizabeth, James I. and Charles I. He was born in Lincolnshire, and educated at Cambridge. He composed wholly or in part 220 different plays. Of these only about twenty-four remain, of which the one most admired is *A Woman Killed with Kindness*, published in Dodsley's *Collection*. He was also the author of *Great Britain's Troy*, *An Apology for Actors*, and a number of other works.

Hezekiah (hez-e-kī'a; *Hizkiyah*, generally *Hizkiyahu*, strength of Jehovah), the twelfth King of Judah, and one of the best. He succeeded Ahaz about 717 B.C., and died about 698 B.C. He repressed idolatry, fought successfully against the Philistines, and hoped to become entirely independent of Assyria, but had his fenced cities captured, and was mulcted in a large tribute. About this time Hezekiah had a serious illness from which he miraculously recovered, and celebrated his fresh lease of life in a thanksgiving preserved in Isaiah, xxxviii. Among the ambassadors who came with letters and gifts to congratulate him on his recovery was the viceroy of Babylon, to whom he displayed the royal treasures. For this he received a terrible rebuke, and he was told by Isaiah that from Babylon would come the ruin and captivity of Judah. The greater part of the Scripture records bearing on the reign of Hezekiah is occupied by the two invasions of Sennacherib, and the sudden destruction of the Assyrian army. Hezekiah did not long survive this deliverance.

Hiawatha (hī-a-wä'thä), an Indian legendary hero and peace-maker, known by this name among the Iroquois and by other titles among the other tribes of North America. He is mentioned in various works on the aborigines, and in 1855 was immortalized in the poem, *Hiawatha*, by Longfellow.

Hibben, JOHN GRIER, an American educator, born in Peoria, Illinois, in 1861. He was graduated at Princeton University, in 1882, and at Princeton Theological Seminary, 1886. After a year of study at the University of Berlin he was ordained a Presbyterian minister in Chambersburg, Pennsylvania. In 1891 he became instructor at Princeton; in 1895, professor of logic; and in 1912, president of the university.

Hibbing, a village in St. Louis County, Minnesota, 80 miles N. W. of Duluth. It has mining and lumbering interests. Pop. 8832.

Hibernia (hī-ber'ni-a), the ancient name of Ireland, applied to it first by Julius Cæsar.

Hibernians, ANCIENT ORDER OF, a Catholic organization instituted about 1650 for the protection of the Catholic religion in Ireland, but now devoted to 'the advancement of the principles of Irish nationality.' It has extended to other countries. The American branch has 250,000 members.

Hibiscus (hī-bis'kus), an extensive genus of plants, nat. order Malvaceæ (mallows), chiefly natives of tropical climates. The species are remarkable for abounding in mucilage and for the tenacity of the fiber of their bark, whence several are employed for many economical purposes in the different countries where they are indigenous. The petals of *H. rosa-sinensis*, a plant with large, handsome, usually red flowers, frequent in green-houses, are astringent, and used in China as a black dye for the hair and eyes. The handsome flowering shrub known in gardens as *Althæa frutex* is a species of hibiscus (*H. syriacus*). The root of *H. Manihot* yields a mucilage used in Japan as size and to give a proper consistence to paper. The leaves of *H. esculentus* are eatable, and an oil is extracted from its seeds, while it is cultivated in India for its fiber.

Hiccup, or HICCOUGH, (hik'up), is a convulsive catch of the respiratory muscles, with sonorous inspiration repeated at short intervals. Though generally a trivial and transient inconvenience, its occurrence in the last stages of acute disease is often a fatal symptom.

Hickes (hiks), GEORGE, an English divine, philologist, and antiquary, was born in 1642; died in 1715. He became dean of Worcester in 1683,

but of this he was deprived in 1690 for refusing to take the oaths to William III after the Revolution. He followed the fortunes of James II, and was consecrated suffragan Bishop of Thetford in 1694 by the non-juring Archbishop Sancroft. Of his numerous works the most important are *Institutiones Grammaticæ Anglo-Saxonicæ et Mœso-Gothicæ*, etc. (Oxon. 1689), and *Linguarum veterum septentrionalium, Thesaurus Grammatico-Criticus et Archæologicus* (Oxon., 1705).

Hickory (hik'o-ri), the name given to several species of timber trees of the genus *Carya*, belonging to the nat. order Juglandaceæ (walnut). They are natives of the United States, and are remarkable for stateliness and general beauty. The wood is heavy, strong, and tenacious, and is used for making carriage-shafts, screws, whip-handles, cogged wheels, etc. The shag-bark (*C. alba*) yields the hickory nut of commerce, and its wood is very valuable. *C. olivæformis* yields the pecan-nut. The pig-nut or brown hickory is the *C. glabra*, and the swamp hickory is *C. amara*, so called from the bitterness of its nut.

Hicks, Elias, a noted preacher in the Society of Friends, born at Hempstead, New York, in 1748; died in 1830. He was an active abolitionist, and was instrumental in inducing the New York legislature to pass an act in 1827 which liberated all slaves within the state. His ministerial services were continued for 50 years without compensation, and he gradually came to advocate the most radical Unitarian doctrines. This in time led to a disruption of the society, a body being organised under his teachings who are now popularly known as 'Hicksites.'

Hidalgo (ē-thäl'gō), a state situated in the center of Mexico. In the N. it is very mountainous and well wooded, with extensive silver, copper, and iron mines; but in the S. it is level and fertile, and stock-raising and farming are the chief industries. It has also a trade in cotton and tobacco. Area, 8575 sq. m. Pop. 641,895.

Hides (hīds), the skins of animals, either raw or dressed; but the name is more commonly given to the undressed skins of the larger domesticated animals, as oxen, horses, etc., the smaller being called skins. The hide trade is now an important one.

Hieracium (hī-er-ā'si-um). See *Hawkweed.*

Hiera Picra (hī'er-a pi'kra), 'Holy Bitter,' a warm cathartic composed of aloes and canella bark made into a powder and mixed with honey, still a favorite in domestic medicine and veterinary practice.

Hierapolis (hī-er-ap'o-lis), a ruined city of Asiatic Turkey, near the right bank of the Lycus, 121 miles east by south of Smyrna. It was famous for its thermal springs, was the birthplace of Epictetus, and is mentioned by St. Paul in his epistle to the Colossians (iv, 13).

Hierarchy (hī'ér-ar-kē; from Gr. *hieros*, sacred, and *archē*, government), sacred government, sometimes the church, sometimes the rule which the ecclesiastical governing body exercised as at once priests and civil magistrates. In the former sense the hierarchy arose with the establishment of the Christian church as an independent society. In the middle ages the papal hierarchy gathered great strength, and the pope became a spiritual monarch, ruling western Christendom with power but feebly limited by princes and councils. A reactionary movement began in the 14th century, and the general tendency of subsequent events has always been to make the civil and hierarchical power more and more independent of each other. The term *hierarchy* as used to denote the governing and ministering body in the church, according to its several gradations, can strictly be applied only to those churches which are ruled by bishops, such as the Roman Catholic Church and the Anglican Church, which also holds the theory of a hierarchical gradation of rank and authority. Both these churches comprise the three orders of bishops, priests, and deacons.

Hieratic Writing (hī-ér-at'ik; Gr. *hieratikos*, sacred), the mode of writing used by the Egyptian priests in their records. See *Hieroglyphics.*

Hiero I (hī'e-rō), an ancient Greek ruler or 'Tyrant' (that is, absolute monarch) of Syracuse in Sicily, brother of Gelon, whom he succeeded in 478 B.C. He was an enlightened ruler, and a patron of genius and learning. His court became the rendezvous of the most distinguished writers of his time, including Pindar, Æschylus, Bacchylides, Epicharmus, and Simonides. The *Hiero* of Xenophon contains the finest eulogium of this monarch. He was several times victor in the Grecian games. Pindar has celebrated his victories; several odes of this poet are filled with his praises. Hiero died at Catana, 467 B.C.

Hiero II, King or Tyrant of Syracuse (269-214 B.C.), son of Hierocles, a noble Syracusan, who claimed a descent from the family of

Gelon. He was chosen by the soldiery as general in 275 B.C., and recognized as king about 270. In 264 he made an alliance with the Carthaginians against Rome, and thus began the first Punic war. Being defeated by the Romans he made peace by the payment of tribute, and was ever after a faithful and useful ally to them. His subjects enjoyed great prosperity during his reign. Hiero devoted himself to the construction of military machines of all kinds, and ships of great size, under the direction of Archimedes, who lived in Syracuse during this reign.

Hierochloe (hī-ĕr-ok'lo-ē), HIEROCHLOA. See *Holy-grass*.

Hieroglyphics (hī-ĕr-u-glif'iks; from Gr. *hieros*, sacred, and *glypho*, I engrave), a term originally applied to the inscriptions sculptured on buildings in Egypt, in the belief that the writing was confined to sacred subjects, and legible only to priests. The term has also been applied to picture-writing in general, such as that of the Mexicans and the still ruder pictures of the North American Indians. Three different modes of writing were used by the ancient Egyptians, the *Hieroglyphic*, the *Hieratic*, and the *Demotic*. Pure hieroglyphic writing is the earliest, and consists of figures of material objects from every sphere of nature and art, with certain mathematical and arbitrary symbols. Next was developed the hieratic or priestly writing, the form in which most Egyptian literature is written, and in which the symbols almost cease to be recognizable as figures of objects. Hieratic writings of the third millennium B.C. are extant. In the demotic or *enchorial* writing, derived directly from the hieratic, the symbols are still more obscured. The demotic was first used in the ninth century B.C., and was chiefly employed in social and commercial intercourse. Down to the end of the eighteenth century scholars failed to find a clue to the hieroglyphic writings. In 1799, however, M. Bouchard, a French captain of engineers, discovered at Rosetta the celebrated stone which afforded European scholars a key to the language and writing of the ancient Egyptians. It contained a tri-lingual inscription in hieroglyphics, demotic characters, and Greek, which turned out to be a decree of the priests in honor of Ptolemy V, issued in 195 B.C. The last paragraph of the Greek inscription stated that two translations, one in the sacred and the other in the popular Egyptian language, would be found adjacent to it. The discovery of an alphabet was the first task. The demotic part of the inscription was first examined by De Sacy and Akerblad, and the signification of a number of the symbols ascertained. The hieroglyphic part was next carefully examined and compared with the demotic and Greek. At last after much study Champollion and Dr. Thomas Young, independently of each other, discovered the method of reading the characters (1822), and thus provided a clue to the decipherment of the ancient Egyptian writing.

Hieroglyphic characters are either *ideographic*, i. e., using well-known objects as symbols of conceptions, or *phonetic*, i. e., representing words by symbols standing for their sounds. The phonetic signs are again divided into alphabetical signs and syllabic signs. Many of the ideographic characters are simple enough: thus the figure of a man, a woman, a calf, indicate simply those objects. Others, however, are less simple, and convey their meaning figuratively or symbolically. Water was expressed by three zigzag lines, one above the other, to represent waves or ripples of running water, milk by a milk-jar, oil by an oil-jar, fishing by a pelican seizing a fish, i. e., fishing; seeing and sight by an eye; and so on. The nature of the phonetic hieroglyphs, which represent simply sounds, will be understood from an explanation of the accompanying cuts.

1. The first hieroglyph in the name of Kleopatra is a knee, which is *kne* or *kit* in Coptic, and represents the K of Kleopatra. K does not occur in the name Ptolemaios. 2. The second hieroglyph in Kleopatra is a lion couchant, which is *laboi* in Coptic, and *labu* in the old Egyptian, and represents the L of both names. In Kleopatra it occupies the second place, and in Ptolemaios the fourth. 3. The third hieroglyph in Kleopatra is a reed, which is *ekê* in Coptic and *ash* in the old Egyptian and represents the E of Kleopatra. The reed is doubled in Ptolemaios and occupies the sixth and seventh places, where it represents the diphthong ai of Ptolemaios. 4. The fourth hieroglyph in Kleopatra is a noose, which represents the O of both names and occurs in the third place of Ptolemaios. 5. The fifth hieroglyph in Kleopatra is a mat, which represents the P of both names, and is the initial of Ptolemaios. 6. The sixth hieroglyph in Kleopatra is an eagle, which is *akhoom* in Coptic, and repre-

Cartouche of Cleopatra.

sents the A, which is found twice in the name Kleopatra, but does not occur in the name Ptolemaios, although the diphthong *ei* occurs as described above, No. 8. 7. The seventh hieroglyph in Kleopatra is a hand, which is *toot* in Coptic, and represents the T of Kleopatra, but does not occur in Ptolemaios, where it might be expected to occupy the second place. The second place of Ptolemaios is occupied by a semicircle, which is found at the end of feminine proper names, and is the Coptic feminine article T. The researches of Champollion satisfied him of the existence of homophones, or characters having the same phonetic value and which might be interchanged in writing proper names. 8. The eighth hieroglyph in Kleopatra is a mouth, which is *ro* in Coptic, and represents the R of Kleopatra. 9. The ninth hieroglyphic in Kleopatra is the eagle, which is explained in No. 6 above. 10. The semicircle is the T of Ptolemaios, which with 11, the egg found at the end of proper names of women, is a feminine affix. In the name of Ptolemaios there is still the M and the S to account for. The fifth hieroglyph in the cartouche of Ptolemaios is a geometrical figure, consisting of three sides of (probably?) a parallelogram, but now called a hole, because the Coptic *ms* has that signification, and represents the M. The hook represents the S of the word Ptolemaios. Vowels were only regarded by the Egyptians as they were needed to avoid ambiguous writing.

Cartouche of Ptolemy.

There are groups of hieroglyphs of which one element is an ideographic sign, to which a phonetic complement is added to indicate the pronunciation of the ideographic sign. The words of a text could be written in hieroglyphs in three ways—1, by phonetic hieroglyphs; 2. by ideographic hieroglyphs; and 3, by a combination of both. According to Ebers, in the perfected system of hieroglyphics the symbols for sounds and syllables are to be regarded as the foundation of the writing, while symbols for ideas are interspersed with them, partly to render the meaning more intelligible, and partly for ornamental purposes, or with a view to keep up the mystic character of the hieroglyphics.

Hieronymites (hī-ĕr-on'i-mīts), or JERONYMITES, hermits of St. Jerome (Hieronymus), an order of religious persons established in 1374, who wear a white habit with a black scapulary. They possessed the convent of St. Lawrence in the Escurial, and still have convents in Sicily, the West Indies, and South America.

Hieronymus, St. See *Jerome, St.*

Higginson (hig'in-sun), THOMAS WENTWORTH, an American writer, born in Cambridge, Massachusetts, in 1823. An active abolitionist, he took part in the troubles in Kansas in 1856, and was colonel of a colored regiment in the Civil war. He is the author of works of history, fiction, biography, and essays, including *Malbone*, a romance, *Outdoor Papers*, *Oldport Days*, *History of the United States*, *Concerning All of Us*, *Tales of the Enchanted Islands*, etc. He died May 9, 1911.

High Altar. See *Altar.*

High Church, a term applied to a party in the Church of England. It originally indicated a party among the younger clergy during the latter part of the reign of Elisabeth, who asserted that Calvinism was inconsistent with the ancient doctrine and constitution of the primitive church, and who claimed a divine right for episcopacy. Bishop Andrewes was the chief writer of this party, and Laud became its most active leader. The term now generally refers to those who exalt the authority and jurisdiction of the church, and attach great value to ecclesiastical dignities and ordinances, being more or less identified with the ritualistic party. See *Ritualism.*

Highgate (hī'gat), a N. W. suburb of London, situated on a hill commanding fine views of the metropolis and the surrounding country, 5½ miles from St. Paul's.

High German, originally the Teutonic dialect spoken in the southern and elevated parts of Germany, as distinguished from Platt Deutsch or Low German, spoken in the northern and more lowland portions of Germany. See *Germany.*

Highlands (hī'lands), a somewhat indefinite geographical division of Scotland, N. and W. of a line running N. E. from Dumbarton on the Clyde through the counties of Dumbarton, Stirling, Perth, Forfar, Kincardine; then N. W. through Aberdeen, Banff, Moray, and Nairn to the shores of the Moray Firth. The Highlands are generally subdivided into two parts, the West Highlands and the North Highlands. The whole of the district, which embraces the Celtic-speaking part of Scotland, is wild,

rugged, and mountainous, with much grand and picturesque scenery. The western coast is indented by many narrow arms of the sea, and is flanked by numerous islands. Forming, by their natural characteristics, a region distinct from the Lowlands of Scotland, the Highlands were long in a state of political semi-independence, and socially and otherwise —and particularly in retaining the use of the Gaelic tongue—the people have still certain characteristics peculiar to themselves. What especially separated this region from the rest of Scotland, was not only the Celtic language and blood, but also the clan system and all connected with it. See *Clan*.

In the earliest times the Highland chiefs gave allegiance to higher chiefs or princes, by whom the Scottish kings were acknowledged as sovereigns merely in name. Among these native princes were the powerful lords of the Isles, who flourished from very ancient times to the reign of James V. They ruled over all the Western Islands (the Hebrides) from Islay north, and over the western part of the county of Inverness, and as powerful allies exerted an influence over the greater part of the Highlands. In the early part of the fifteenth century the Highlanders threatened to overrun great part of the Lowlands, but they received a check in the defeat of Donald of the Isles at Harlaw in 1411. From this time onward their incursions on the Lowland parts of Scotland were confined chiefly to occasional plundering raids. In the wars of the seventeenth century the Highlanders were largely engaged on the side of the Stuarts, and great numbers fought under both Montrose and Dundee. After the suppression of the rising of 1715 a strenuous attempt was made to break up the tribal organization of the Highlanders. An act was passed in 1724 for their disarmament; between 1726 and 1737 great military roads were formed under the direction of General Wade, and a chain of fortified military posts constructed, to overawe the people. The chieftains made every effort to maintain their threatened power, and to destroy the effect of the innovations with which the government sought to weaken the bonds of the clans, but the weakening went on. The rebellion of 1745 gave the government an opportunity of hastening the process, by the abolition of heritable jurisdictions (which see), and of the ancient privileges of the chiefs. A stringent law for disarming the people was passed, and they were even prohibited from wearing their national dress, a prohibition not formally removed till 1782. The great extension of sheep-breeding and the appropriation of large tracts to game have tended much to depopulate some parts of the Highlands. In other parts, notably in some of the Western Islands, the population has increased beyond a point where their circumscribed condition could support them, and much discontent, agitation, and trouble have been the result. (See *Crofters*.) The Highland dress, so well known at the present day, is modern in a good many of its features, and especially so in the great variety of tartans that have been invented, and of which each clan now appears to claim one. There are a number of regiments in the British army originally recruited in the Highlands, and known as Highland regiments, or Highlanders. The organization of these is still kept up, each regiment having its distinctive tartan, some retaining the kilt, others wearing trousers.

Highness (hī'nes), a title of honor given to princes or other persons of rank, used with poss. pronouns *his*, *her*, etc., and with the addition of *royal*, *imperial*, *serene*, applied to the members of royal, imperial, and some German sovereign families.

High Places, in Scripture, eminences or mounds on which sacrifices were offered. Altars and places of worship were erected from the very earliest times on the tops of hills, etc. As such a practice led to idolatrous observances, it was strictly forbidden by the law of Moses. High places are frequently mentioned in conjunction with *groves*.

High Point, a city in Guilford County, North Carolina, 34 miles N. E. of Salisbury. It has wood-working mills and cotton, tobacco and other factories. Pop. 9525.

High Priest, the head of the Jewish priesthood. In the books of Moses the holder of this dignity is simply designated the priest; the epithet *high* occurs on one or two occasions, but as a distinctive epithet it appears to have been added subsequently. The formal consecration of Aaron, the brother of Moses, together with his sons, to a hereditary priesthood, is recorded in Exod., xxviii. The high priesthood continued in the line of Aaron, sometimes in one, and sometimes in another branch of it, until the coming of Christ. From B.C. 153 till the time of Herod the Great the regal and priestly authority were united in members of the Asmonæan family (the Maccabees). After the subjugation of the Jews the high priesthood was often arbitrarily conferred by the foreign masters.

High Seas, the open sea. The principle now accepted regarding the ocean highway is that the jurisdiction of maritime states extends for only 3 miles, or within cannon range of their own coasts, the remainder of the seas being high seas, accessible on equal terms to all nations. Inland seas and estuaries, of course, are excepted.

High Schools, in the United States, public schools offering instruction between the elementary or common schools and the college or university. The high school has gradually superseded the older academy or elementary school of the classical type, and the curriculum is being constantly altered to meet the needs of the modern industrial system. Business subjects, manual training, agriculture, and actual instruction in the trades have been introduced into many high schools. Seven lines of work have been declared by the High School Teachers' Association to be essential: language, mathematics, history and civics, science, music, drawing and manual training. The length of the high school course is four years, and the usual age of pupils upon entrance is fourteen years. About 5 per cent of the students prepare for college. Many city high schools have evening classes for those unable to attend during the day.

Highways. See *Road.*

Hilary (hil'a-ri), St., one of the early fathers of the church, born at Poitiers, of which city, after his conversion from heathenism, he became the bishop about 350. His contests with the Arians caused his banishment to Phrygia, whence he returned after some years, and was an active diocesan till his death in 367.

Hilda (hil'da), Saint, a grandniece of Edwin, king of Northumbria, born about 614; died in 680. At the age of fourteen she was baptized by Paulinus. She was successively head of the abbey of Hartlepool and of the famous monastery at Whitby.

Hildesheim (hil'des-hīm), a city of Prussia, the see of a bishopric since 822. It retains splendid specimens of mediæval architecture. Pop. (1910) 50,246.

Hildreth (hil'dreth), Richard, historian, was born at Deerfield, Massachusetts, in 1807. He edited the *Boston Atlas*, was on the staff of the New York *Tribune* and published various works. He is best known, however, by his *History of the United States*, published 1849–52, and regarded as a standard work. He died at Florence, Italy, in 1865.

Hill, David Bennett, lawyer and statesman, born in Havana, New York, in 1843; died in 1910. He was admitted to practice of the law in 1864, was elected to the State legislature in 1870, and made lieutenant-governor of New York in 1882, succeeding Mr. Cleveland as governor when the latter became President. He was nominated and elected governor by the Democratic party in 1885 and again in 1888, and was made United States Senator in 1891. He was a prominent candidate for the presidential nomination in 1892, and in 1904 practically controlled the Democratic presidential nomination.

Hill, David Jayne, educator, born at Plainfield, New Jersey, in 1850. He was professor of rhetoric at Bucknell University in 1877-79; president, 1879-88; and president of the University of Rochester, 1888-96. He was appointed first assistant United States Secretary of State in 1898 and ambassador to Germany in 1908. He wrote several works on rhetoric, biographies, etc.

Hill, James Jerome, railroad official and financier, born near Guelph, Canada, in 1838. He was engaged for years in railroad enterprises in the West and in 1890 became actively interested in building the Great Northern Railway, extending from Lake Superior to Puget Sound. He became president of the Great Northern system in 1893, and retired in 1907, remaining chairman of the board of directors. He was vice-president of the New York Chamber of Commerce. Died May 29, 1916.

Hill, Rowland, a popular preacher, notable for his humor and eccentricities, son of Sir Rowland Hill, Bart., of Hawkstone in Shropshire, was born in 1744; died in 1833. He was ordained in the Anglican Church, but embracing the views of the Calvinistic Methodists, he soon began to preach in barns and meeting-houses, and when they were too small or too distant, or not to be procured, in streets, fields, and highways. In 1783 he laid the foundation of Surrey Chapel in the Blackfriars Road, London, where he preached with great success every winter for about fifty years, making summer excursions to the provinces, where his preaching attracted immense crowds. He published sermons and other theological works, of which the best known are his *Village Dialogues.*

Hill, Rowland (Viscount Hill), a British general, nephew of the above, was born in 1772; died in 1842. He entered the army in his sixteenth

year, obtained the rank of captain in 1793, and became colonel of the 90th Regiment in 1800. He took part in the Egyptian campaign, and in 1806 was made major-general. He served with great distinction during the campaigns of Moore and Wellington in the Peninsula. In 1809 he became lieutenant-general; in 1812 he was made a K. B.; and in 1814, on being made a peer by the

Viscount Hill.

title of Baron of Almarez and of Hawkstone, Parliament voted him a perpetual pension of £2000. At Waterloo he commanded the right wing of the British, and he was personally thanked by Wellington for his services. In 1828 he was appointed commander-in-chief of the British army, a post which he held till 1842, when he retired and was made a viscount.

Hill, Sir Rowland, an English postal reformer, born at Kidderminster in 1795; died in 1879. He was engaged as a schoolmaster till 1833, shortly after which he was appointed secretary to the commissioners for the colonization of South Australia. In 1837 he published a pamphlet recommending the adoption of a low and uniform rate of postage throughout the United Kingdom. The scheme was approved by a committee of the House of Commons, which examined its details in 1838, and early in 1840 the penny postage system, which seems to have been originally proposed by Mr. James Chalmers of Dundee, was carried into effect with the assistance of Mr. Hill, who, for this purpose, received an appointment in the Treasury. In 1846 he received a public testimonial of the value of upwards of £13,000. In 1846, he was made secretary to the postmaster-general, and in 1854 chief secretary to the post-office. In 1860 he became K.C.B. He retired from the post-office four years later with a pension of £2000, besides a grant of £20,000 voted by parliament.

Hillah (hil'lä), a town of Asiatic Turkey, 60 miles south by west of Bagdad, on the Euphrates, among the ruins of ancient Babylon. It has good bazaars, and manufactories of silk and leather. The Euphrates is here crossed by a floating bridge. Pop. about 10,000.

Hillel (hil'el), a Jewish rabbi, born at Babylon about B.C. 112. He came to Jerusalem, it is said, at about forty years of age, became president of the Sanhedrim and founder of the school of Hillel. Shammai, another member of the Sanhedrim, became the head of a rival and hostile school. Hillel's party was the more liberal of the two, and became the dominant one.

Hill Forts, the refuges and strongholds of the early inhabitants, existing in every country of Europe. Their range in time extends from the early prehistoric through the early historic periods of the racial areas in which they are found. They were the original sites of various cities, such as Jerusalem, Athens, and Rome.

Hillsboro, (hils'bo-ro), a city, capital of Hill County, Texas, 66 miles S. W. of Dallas. Manufactures cotton cloth, cottonseed-oil, flour, advertising novelties, etc. Pop. 7500.

Hillsdale, a city, capital of Hillsdale County, Michigan, 90 miles S. W. of Detroit. It has a creamery, milk condensery, flour mills, and varied manufactures. Pop. 5001.

Hill States, a collective name given to several independent and feudatory states of India. They are situated on the east side of the Sutlej, and comprise about twenty states, including Sirmar, Bilaspur, Bashahr.

Hill Tipperah, a native state of Hindustan, adjoining the British district of Tipperah, Bengal. The country is hilly, several ranges of hills running parallel from N. to S., with broad intervening valleys. Wild elephants and other large game abound in the forests. The principal crop is rice, and tea is indigenous in some parts of the hills. The government is despotic and patriarchal, and a resident political agent protects British interests. Area, 4086 square miles. Pop. 173,325.

Hill Tribes, the name given collectively to the numer-

ous wild tribes inhabiting the mountainous regions of India.

Hilo (hē'lō), the chief town of the island of Hawaii, and the second largest in the Sandwich Islands. It has the only harbor on the E. side of Hawaii and considerable trade, there being large sugar plantations in its vicinity. Pop. 19,785.

Hilprecht (hil'prekt), HERMAN VOLRATH, archæologist, born at Hohenerxleben, Germany, in 1859. In 1886 he became professor of Semitic Philology at the University of Pennsylvania, and was the leader of several expeditions sent to explore the sites of ancient Babylon and other Asiatic cities. He gathered much valuable material, has written many papers on Babylonian and oriental subjects, and is a prominent authority in cuneiform writings. His work on the subject of texts from the Nippur library gave rise to a widespread controversy.

Himálaya (hi-mā'lā-ya, or him-a-lā'ya; Sanskrit, *Himálaya*, the abode of snow), a chain of snowy mountains in Asia, the most elevated on the earth, which separates the Indian Peninsula from the plateau of Tibet, between the 72d and 96th degrees of E. lon., or between the Indus on the west and the Brahmaputra on the east; length about 1500 miles, average breadth about 180 miles. The direction of the Himálaya range from the Indus is for great part of its length from northwest to southeast, after which it curves gradually to the east, or slightly to the northeast. The great plain of India, south of the Himálaya, has a general elevation of 1000 feet above the sea. The transition from this plain to the ascent of the range is marked in the northwest by a belt of dry porous ground broken up into numerous ravines. East of this the *Tarai*, a belt of sloping marsh land, occupies the same position. The *Tarai* is covered with forest and jungle, is crowded with wild animals, and is very malarious. Beyond this lies the Bhabar, a belt of a gravelly and sandy nature covered with forests of valuable timber-trees. The *dúns*, *maris*, or *dwars*, longitudinal valleys partly cultivated and partly yielding forest growth, occupy the space between the *Bhabar* and the slope of the Himálayas themselves. The general height of the Himálayas is double that of the Alps; the passes over the former ordinarily exceed, often by half a mile, the elevation of Mont Blanc. The Ibi-Gamin Pass in Garhwal, the highest of all, is 20,457 feet, the Mustagh 19,019 feet, the Parangla 18,500 feet, the Kronbrung 18,313 feet, and the Dura Ghát 17,750 feet high. There are several summits in the Himálaya which approach closely to double the absolute elevation of the highest of the Alps, and 120 of them are stated to be above 20,000 feet. The rivers of the Punjab ('Five Waters') spring from a portion of the great chain which may be considered a distinct group under the title of the Northwestern Himálaya. Some of the peaks here rise to a height of 24,000 to 25,000 feet; or to 28,278 feet if the Karakorum is regarded as part of the Himálayas. In the Central or Middle Himalayas rise the sources of the Ganges and Jumna, in a region regarded by the Hindus as holy ground. Farther eastward, in Nepal, is the highest part of the Himálaya, so far as it is known and measured. Dhawalagiri has an elevation of 26,826 feet, the Gaurisankar or Mount Everest, the highest known mountain in the world, is 29,002 feet; the Yasen group rises to the height of 26,680 feet, the Ibjibia group to 26,5 [illegible]. Going farther east, in Sikkim, or on its borders, we find Kanchinjinga, the western peak of which is 28,156 feet high, the eastern 27,815 feet, while the Kábru ridge rises to 24,015 feet. Sikkim forms a comparatively narrow but interesting territory, walled in on three sides by stupendous mountains from 17,000 to 28,000 feet high. Here terminates the region of the Middle Himálaya, most of the streams from which unite in the Ganges. The Eastern Himálaya, which extends from Sikkim east to the Brahmaputra and completes the chain, sends all its waters to the last-named river, and is all comprised in Bhutan. A little to the east of Sikkim, Chamalari attains the height of 23,944 feet. About 250 miles further east a conspicuous group has been observed with two peaks, named the Gemini or Twins, 21,500 feet high. Thence towards the east the mountains sink rapidly, but the range may be traced beyond the right bank of the Brahmaputra. This stream, as well as the Indus, rises on the little-known north side of the Himálaya, their sources not being far apart. The snowy ridge of the Himálayas, as far as examined, consists everywhere of granite, with which are immediately associated gneiss and mica-slate, followed, in descending, by metamorphic and secondary rocks till we arrive at the more recent alluvial deposits. Earthquakes are still frequent within this region; and hot springs gush forth in abundance, even from beneath the snow. The limit of perpetual snow in the middle division (lon. 78° E.) is stated to be about 15,500 feet on the south side and 18,500 feet on the north-

era. In Sikkim the snow-line descends on the south side to 14,500 feet, while on the north it rises to a level of 19,000 feet. Immense glaciers exist at various parts. The vegetation of the Himálayas is very rich, there being forests of pine, spruce, silver-fir, and deodar cedar at suitable elevations, with rhododendrons in rich profusion. Among the more characteristic animals are the yak, musk-deer, wild sheep, etc.

Himera (him'e-ra), an ancient Greek town on the N. coast of Sicily, the site of which is near the modern Termini. Here Gelon and Theron annihilated the army of Hamilcar the Carthaginian (480 B.C.). In 409 B.C. Hannibal, grandson of Hamilcar, razed the town to the ground.

Himyarites (him'yar-īts), a race or group of races in Arabia, regarded as descendants of Himyar, one of the mythical ancestors of the Arabs. According to tradition they became the dominant race in Yemen about 3000 years before Mohammed, and spread to the Euphrates on the one hand and Abyssinia on the other. Their most flourishing period appears to have been from about 100 B.C. till A.D. 629, when they succumbed to Mohammedanism. The *Himyaritic language*, not now spoken, formed, with the Arabic and Æthiopic, the southern branch of the Semitic family of tongues. During the last hundred years several hundreds of Himyaritic inscriptions have been collected, and deciphered by means of alphabets with the corresponding Arabic letters which had been preserved. The Mahrah tribes of S. Arabia are the direct descendants of the ancient Himyarites.

Hinckley (hink'lē), a town of England, partly in Warwickshire, but mostly in the county of Leicester. It lies 12 miles southwest of Leicester, and contains an ancient church. Pop. (1911) 12,838.

Hincmar (hink'mar), Archbishop of Rheims, ecclesiastic and statesman, was born about 806; died at Epernay 882. He was at first a monk in the Abbey of St. Denis. In 845 he was elected archbishop of Rheims, where he exercised extensive political as well as ecclesiastical authority. He was a man of enlightenment, one of the best scholars of his age, and was distinguished as a defender of the liberties of the church. He wrote two treatises on Predestination, and numerous other works.

Hind (hind), the female of the stag, or red-deer. See *Deer*.

Hindenburg, PAUL VON, German Field Marshal, was born at Posen in 1847. He entered the army, was decorated for courage at Sadowa, 1866, and also in the Franco-Prussian War, 1870. Placed on the General Staff, he was made major-general in 1900, lieutenant-general in 1903, and retired in 1911. He re-entered the army in 1914, won the victory of Tannenberg, defeating the Russians with great loss, and in November was made field marshal. In 1916 he was placed in supreme command over the eastern front, and on August 20 succeeded General von Falkenhayn as chief of the General Staff.

Hindi (hin'di), one of the languages of India, being that form of Hindustani which employs the Devanágari or Sanskirt character.

Hindley (hind'lē), a town of England, in Lancashire, giving name to one of the parliamentary districts of S. W. Lancashire. Cotton manufacture is the chief industry, and coal abounds in the vicinity. Pop. 24,106.

Hinduism. See *Brahmanism*.

Hindu Kush (hin'dō kōsh), or INDIAN CAUCASUS, a mountain system of Central Asia. It is generally considered as a continuation of the Himálayas, which it adjoins at the Indus, and then stretches west till it unites with the Ghur Mountains in North Afghanistan. Its culminating point, in the range of Hindu-Koh, to the north of Cabul, is said to be about 20,000 feet. In many features the Hindu Kush resembles the Himálayas proper, though it is lower and without forests.

Hindus, or HINDOOS. See *India*.

Hindustan (hin-du-stān'), the name commonly given to the whole Indian empire, properly applies only to the Punjab and the valley of the Ganges.

Hindustani (hin-dus-ta'nē), one of the chief languages of India, having various forms or dialects. When written in the Persian character, it is known at Urdu, another form of it is called Hindi.

Hiogo (hē-ō'gō), a seaport of Japan, opened to foreign trade in 1860. It is situated on the island of Hondo, on the Bay of Osaka, 40 miles S. W. of Kioto. The trade with the interior is important, and the exports large. Pop., inclusive of Kobe, 285,002.

Hiouen-Thsang (yoo'en-tsang), a Chinese traveler and Buddhist priest, born about A.D. 602; died in 664. He wrote travels in India, and translated many Hindu books on Buddhism into Chinese.

Hip, the fruit of the dog-rose or wild brier. It contains tannin, sugar, citric and malic acids, and is sometimes used in making conserves.

Hip-joint, the joint of the hip, a ball-and-socket joint formed by the reception of the globular head of the femur or thigh-bone into the socket or acetabulum of the os innominatum. For flexion, extension, rotation, and strength combined, it is the most perfect joint in the body.

Hipparchus. See *Hippias.*

Hipparchus (hip-ar'kus), an ancient Greek astronomer, was born at Nicæa, in Bithynia, and lived about B.C. 160-125. He resided for some time at Rhodes, but afterwards went to Alexandria, then the great school of science. A commentary on Aratus is the only work of his extant. He first ascertained the true length of the year, discovered the precession of the equinoxes, determined the revolutions and mean motions of the planets, prepared a catalogue of the fixed stars, etc.

Hipparion (hip-ar'i-on), a fossil genus of the horse family, of the Upper Miocene and Pliocene periods. The members are distinguished by the fact that each foot possesses a single fully-developed toe, bordered by two functionless toes which do not touch the ground, but simply dangle on each side of the central toe. The hipparion was about the size of an ass, one American species being, however, about the size of a goat.

Hippias (hip'pi-as), ruler of Athens, son of Pisistratus, after whose death (B.C. 527) he assumed the government, in conjunction with his brother Hipparchus. The latter being assassinated while conducting a solemn procession to the temple of Minerva, Hippias seized the reins of the government alone, and revenged the death of his brother by imposing taxes on the people, selling offices, and putting to death all of whom he entertained the least suspicion. His tyranny became at last unbearable, and he was expelled from the city B.C. 570.

Hippo (hip'ō), sometimes called *Hippo Regius* to distinguish it from another town of the same name on the Carthaginian coast; an ancient Numidian city, the ruins of which still exist a short distance south of Bona in Algeria. It was the episcopal see of St. Augustine, and was destroyed by the Vandals in 430.

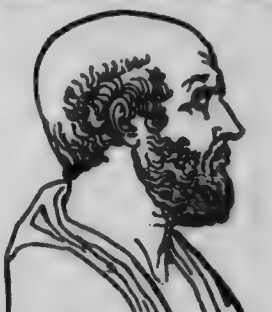
Hippoboscidæ (hip-u-bos'si-dē), a family of dipterous ... is, parasitic on birds and quadrupeds. The type is the genus *Hippobosca* or horse-fly.

Hippocampus (hip-u-kam'pus), a genus of fishes, closely allied to the pipe-fishes, of singular construction and peculiar habits; the upper parts have some resemblance to the head and neck of a horse in miniature, which has suggested the name. When swimming they maintain a vertical position; their general length is from 6 to 10 inches, and they occur in the Mediterranean and Atlantic.

Hippocampus.

Hippocras (hip'u-kras), a medicinal drink, composed of wine (generally a mixture of Lisbon and Canary), with an infusion of mixed spices and other ingredients, formerly much used in England, and still common on the continent.

Hippocrates (hi-pok'ra-tēz), the most famous among the Greek physicians, the father of medicine, born in the island of Cos, B.C. 460. Besides practicing and teaching his profession at home he traveled on the continent of Greece, and died at an advanced age, B.C. 357, at Larissa, in Thessaly. His writings, which were early celebrated, became the nucleus of a collection of medical treatises by a number of authors of different places and periods, which were long attributed to him, and still bear his name. The best edition is that of Littré (in ten vols. 8vo, Paris, 1839-61). Among his genuine writings are the first and third books on epidemics; the aphorisms; on diet in acute diseases; on air, waters, and localities; on prognostics; on wounds of the head. Hippocrates was one of the first to insist on the importance of diet and regimen in disease. He had remarkable skill in diagnosis, practiced auscultation, and taught the doctrine of 'critical days.'



Hippocrates.—Antique bust.

Hippocrene (hip-o-krē'nē; 'The Horse's Fountain'), a

spring on Mount Helicon, a mountain in Bœotia, consecrated to the Muses, the waters of which possessed the power of poetic inspiration. It is said to have risen from the ground when struck by the hoofs of Pegasus.

Hippodrome (hip'u-drōm), the Greek name for the public place where the horse and chariot races were held. In Byzantine times the hippodrome at Constantinople acquired great renown, and factions originating in the hippodrome caused perpetual confusion in all departments of the public service. The name is sometimes applied to a modern circus.

Hippogriff (hip'u-grif), a fabulous animal or monster, half horse and half griffin.

Hippolytus (hip-pol'i-tus), in Greek mythology, son of Theseus, whose stepmother, Phædra, fell in love with him, and accused him to his father in order to revenge herself for his indifference. He was put to death, but his innocence being afterwards established, Phædra destroyed herself. See *Phædra*.

Hippolytus, an early Christian bishop and writer, the details of whose history are involved in obscurity. He appears to have lived about the beginning of the third century, and is supposed to have suffered martyrdom under Alexander Severus. The most important of his writings is the *Philosophumena*, a refutation of heresies, discovered in 1842.

Hippomane (hip-om'ăn), a genus of plants belonging to the Euphorbiaceæ. The *H. Mancinella* is the manchineel.

Hipponax (hip-po'naks), a Greek poet, born at Ephesus in 540 B.C., of whose works only a fragment of 100 lines remains. He was deformed in person, was banished from Ephesus for his satirical raillery, and lived in extreme poverty.

Hipponoüs. See *Bellerophon*.

Hippophagy (hi-pof'a-gi), the practice of feeding on horse flesh. Hippophagi was the name given by old geographers to certain nomadic Scythian tribes on the north of the Caspian Sea, who fed on horse flesh. Horse flesh has been eaten for a considerable time in Germany, and it has been regularly sold in Paris since 1866.

Hippopotamus (hip-po-pot'a-mus), the typical genus of a family of Ungulates, of which two living species are known. One species, *H. amphibius*, is of large size, and is common throughout the greater part of Africa; the other, *H. liberiensis*, is not only smaller, but has other important differences, and is found only in the African west coast rivers, and those flowing into Lake Tchad. The former species has a thick and square head, a very large muzzle, small eyes and ears, thick and heavy body, short legs terminated by four toes, a short tail, two ventral teats, skin about 2 inches thick on the back and sides, and without hair, except at the extremity of the tail. The incisors and canines of the lower jaw are of great strength and size, the canines or tusks being long and curved forward. These tusks sometimes reach the length of 2 feet and more, and weigh upwards of 6 lbs. The animal is killed by the natives partly as food, but also on account of the tusks and teeth, their hardness being superior to that of ivory, and less liable to turn yellow. The hippopotamus has been found of the length of 17 feet, and stands about 5 feet high. It delights in water, living in lakes, rivers, and estuaries, and feeding on water-plants or on the herbage growing near the water. It is an excellent swimmer and diver, and can remain under water a considerable time. The *behemoth* of Job is considered by commentators to be the hippopotamus, as the description of his size, manners, food, and haunts is not unlike those of the latter animal. Among the ancient Egyptians it was revered as a divinity, as it is among the negroes in some localities. Several extinct species are found in old-world tertiary and diluvial formations.

Hippopotamus (*Hippopotamus amphibius*)

Hippurites (hip-ur-ī'tēz), a genus of fossil bivalves, having the under shell of great depth, and of a conical form, with a flat lid or operculum, occurring in the lower chalk. They are allied to the living Chama, or gaping cockle. The *Hippurite limestone* is an important representative of the cretaceous rocks in the south of France and the

Pyrenees, characterised by a large admixture of shells of the family Hippuritidæ.

Hip-Roof, a roof, the ends of which slope so as to have the same inclination to the horizon as its other two sides.

Hiroshima (hē-ro-shē'ma), a commercial city of Japan, on the E. coast of Hondo. Pop. 142,763.

Hirschberg (hirsh'berk), a town of Prussia, Province of Silesia, 78 miles W.S.W. of Breslau. Pop. (1910) 20,560.

Hirsch, EMIL GUSTAV, was born in the independent grand-duchy of Luxemburg, in 1852, and after being educated in Germany, studied first at the University of Pennsylvania and then returned to Germany to continue his studies at the Universities of Berlin and Leipzig. He became a rabbi and minister of Har Sinai Congregation, Baltimore (1877). After holding other charges, he became professor of rabbinical literature and philosophy, University of Chicago. He was editor of the Biblical Department of the *Jewish Encyclopedia* (1903–06); has edited the *Zeitgeist* (Milwaukee), *Reform* (New York), and is now at the head of *Reform Advocate* (Chicago).

Hirsch, MAURICE, BARON DE, born in Munich, Bavaria, in 1831; died in 1896. He realised a vast fortune which he employed in bettering the condition of his race. He was a founder of the Jewish Colonisation Society and gave it a capital of $10,000,000, subsequently increased by $35,000,000.

Hisgen (his'jen), THOMAS LOUIS, manufacturer, born at Petersburg, Indiana, in 1852. He settled in Springfield, Mass., where he engaged in the oil business and had a long fight with the Standard Oil Company. He was candidate of the Independence party for president in 1908.

Hissar (his-sär'), a town of Hindustan, in the Punjab, administrative headquarters of district of the same name. Pop. about 17,000. The district has an area of 3540 sq. miles. Pop. 780,000. Hissar is also the name of a district of Bokhara, in which large crops of grain and cotton are produced. The capital, Hissar, has about 10,000 population.

Histology (his-tol'ō-ji), the study of the tissues which enter into the formation of animals and plants, and their various organs, by means of the microscope and chemical and physical reagents. It may be described as a kind of minute anatomy. It comprehends the structure and mode of development of the various tissues, and is divided into animal histology and vegetable histology.

History (his'tu-ri; Greek *historia*, from *historeō*, I inquire into) is used by Herodotus in the sense which it has since retained, of a narrative of events and circumstances relating to man in his social or civic condition. A record of bare facts by themselves does not constitute history. Such a record (forming a chronicle or annals) is chronologically valuable; but to attain the dignity of history we must have social events and evolution detailed with considerable fullness, and the growth and movements of society, from one phase to another, distinctly traced and recorded. The modern school of historians devote much attention to the social life of the people; their method being further characterized by the utmost accuracy of research, the extreme importance assigned to contemporary documentary evidence, and careful weighing of data. The field of history proper is so far restricted as to its subject, that only the doings of a community possessing something of an independent organic life can constitute it. History may be conveniently divided into ancient, mediæval, and modern; but these divisions have little scientific value. The first includes the Jewish history and that of the nations of antiquity, reaching down to the destruction of the Roman Empire, A.D. 476; the second begins with 476 and comes down to the discovery of America in 1492, or to the Reformation; the third section extends from either of these eras to our own times. The earliest written history is found graven on the monuments of Egypt, Assyria, etc. These, though of the barest description, have the value of contemporary chronicles. Next come the histories found in the canonical books of the Old Testament; but the real inventors of the artistic form of history were the Greeks.

Hitchcock (hich'kok), EDWARD, a geologist, born at Deerfield, Massachusetts, in 1793; died in 1864. After being for four years minister of a Congregational church at Conway, Massachusetts, he was appointed in 1825 professor of chemistry and natural history at Amherst College, and in 1845 president of the same college, and professor of natural theology and geology. He was connected with the state survey of Massachusetts, Vermont, and part of New York, valuable reports on which he published. He was author of various other works, some geological and some of miscellaneous character. These include *Geology of the Connecticut Valley*, a highly popular work on *Elementary Geology*, *Illustrations of*

Surface Geology, Religion of Geology and its Connected Sciences, and *Reminiscences*, published shortly before his death.

Hitchcock, ETHAN ALLEN, diplomatist, born at East Machias, Maine, in 1835; died in 1909. He engaged in mercantile and corporation pursuits, was appointed United States minister to Russia, in 1897, and ambassador in 1898, and entered the McKinley cabinet as Secretary of the Interior in 1899, holding the same office under Roosevelt until March, 1907. He was active in bringing about the prosecution of those accused of defrauding the Indians.

Hitchin (hich'in), a market town of England, in Hertfordshire, 34 miles north of London. The parish church, St. Mary's, contains some fine brasses of the fourteenth, fifteenth and sixteenth centuries, and a notable altarpiece by Rubens. Many women are employed in straw-plaiting, and lavender is largely grown in the vicinity. Pop. 11,906.

Hitopadesa (hit-ō-pa-dā'sha; Sanskrit, goodly instruction), an ancient Sanskrit work, taken from an older work called the *Panchatantra* or the five books, the source also of the collection known as the fables of Bidpai or Pilpay. The book consists of fables, one story growing out of another after the eastern fashion, with verses cited from ancient writers by the interlocutors, and was designed for the instruction of princes. It has been translated into many Asiatic and European languages.

Hittites (hit'īts), a Canaanitish nation first mentioned in connection with Abraham, who bought the field and cave of Machpelah from them. There are notices of them in Palestine during and after the captivity. Egyptian and Assyrian inscriptions seem to indicate that the nation consisted of a confederacy ruled by a number of chiefs, and many relics have been discovered within recent years, indicating that there was at one time a Hittite empire extending over a large area in Asia Minor and Syria. Their chief territory was in the Orontes Valley, and they seem to have played a prominent part in the history of Southwest Asia for a considerable period.

Hitu. See *Itu*.

Hivaoa (hē-va-ō'a), an island in the South Pacific Ocean, the largest of the southwestern group of the Marquesas; 22 miles long east to west; about 10 miles greatest breadth. It is mountainous, and bears indications of volcanic eruptions.

Hive. See *Apiary*.

Hivites (hī'vits), a Canaanitish tribe first noticed in Gen., xxxiv. At the conquest of Canaan the main body occupied the northern confines of Western Palestine. Solomon subjected them to a regular tribute.

H'Lassa. See *Lassa*.

Hoadly (hōd'li), BENJAMIN, an English prelate, born in 1676; died in 1761. He was educated at Cambridge; took orders in 1700, and after being settled in London distinguished himself in controversy with Bishop Atterbury and others. A staunch low-churchman, he was appointed Bishop of Bangor, in 1715. A sermon preached before the king in 1717 gave rise to the 'Bangorian Controversy' regarding the divine authority of the king and the church. He was translated to the see of Hereford in 1721, to Salisbury in 1723, and Winchester in 1734.

Hoang-Ho (hō-ang-hō'), or YELLOW RIVER, a large river in China, the sources of which are in mountains in the Koko-Nor territory, north from Tibet. After a winding course of several hundred miles, it proceeds nearly due north to about lat. 41°; then east for nearly 200 miles, when it suddenly bends round, and flows directly south for about another 200 miles; then turns abruptly east, and flows in that direction till it reaches Lung-men-kau, when it diverges to the northeast, and falls into the Gulf of Pe-che-le, about lat. 37° 30′, and lon. 118° 30′. From the thirteenth century till 1853 the Hoang-Ho entered the sea in lat. 34°, south of the peninsula of Shan-tung, but at the latter date it took its present course. Since then vast sums have been spent in watching and strengthening the banks of the river, which is constantly overflowing at some point. In the autumn of 1887 the whole body of the river burst its banks about 300 miles from its mouth, and flooded about one-sixth of the province of Ho-nan, destroying towns and villages and causing a loss of life, the lowest estimate of which is one million. Its length is estimated at about 2600 miles. It derives its name from the vast quantities of yellow earth held in a state of solution by its waters.

Hoar (hōr), GEORGE FRISBIE, senator, was born at Concord, Massachusetts, in 1826; died in 1904. He graduated from Harvard College in 1846, and afterwards from the Dane Law School, Harvard. He practiced law at Worcester, was elected to the state legislature in 1852, to the state senate, 1857; was mem-

ber of Congress, 1869-77, and United States Senator from 1877 until his death. He served on the Tilden-Hayes Electoral Commission and was chairman of the Republican National Convention of 1880. He has left valuable memoirs of his observations during his long career.

Hoar-frost. See *Frost*.

Hoarhound. See *Horehound*.

Hoatzin (ho-at'sin), or HOACTZIN, *Opisthocómus cristátus*, a singular gregarious South American bird, sometimes called the *crested touraco*, referred by some naturalists to the family Cracidæ (curassows), order Gallinaceæ; by some made to form an order by itself (Opisthocomi); by others regarded as of the order Insessores, and allied to the plantain-eaters. The plumage is brown streaked with white, and the head has a movable crest. It is of the size of a pheasant, and has an enormous crop with a very small gizzard.

Hobart (hō'bèrt), up to 1881 HOBART TOWN, the capital of Tasmania, situated at the foot of Mount Wellington (4166 ft.), on the river Derwent, about 12 miles from its mouth. The city is built in the form of a square, the streets crossing each other at right angles. Among the public buildings are the government house, the government offices, the houses of parliament, town-hall, post-office, museum, Episcopal and Roman Catholic cathedrals, and several other places of worship, many public and private schools, the general hospital, etc. There are several jam manufactories, breweries, flour-mills, tanneries, a woolen factory, etc.; and in connection with the shipping interest first-class patent slips. The harbor is easy of access, and has ample depth, capacity, wharf and dock accommodation. Pop. (1911) 27,526.

Hobart (hō'bart), GARRETT AUGUSTUS, Vice-President, was born at Long Branch, New Jersey, in 1844. He adopted the legal profession and was a member of the New Jersey legislature, 1873-85, being president of the senate, 1881-82. He became very prominent in Republican politics, and after being defeated for the United States Senate in 1884, was nominated for Vice-President, and elected for the term 1897-1901. He died November 1, 1899, before the completion of his term.

Hobbema (hob'be-ma), MEINDERT or MINDERHOUT, a Dutch landscape painter; born at Amsterdam in 1638; died in 1709.

Hobbes (hobz), THOMAS, an English moral and political philosopher, born in 1588 at Malmesbury; [illegible] in 1679. He was educated at Oxford, [illegible] afterwards traveled on the Continent, a tutor in the Earl of Devonshire's family, becoming acquainted with Gassendi, Descartes, Galileo, etc. He was also intimate with Lord Bacon (some of whose works he translated into Latin), Lord Herbert of Cherbury and Ben Jonson. From 1637 to 1641 he resided much at Chatsworth, but becoming alarmed at the probability of political commotions, he went to Paris. He stayed abroad some years, and during that time published most of his works. He also taught mathematics to the Prince of Wales (Charles II), then in Paris, who after the restoration gave him a pension of £100. He spent his latter days with the Devonshire family. The most remarkable of his works is his *Leviathan, or the Matter, Form, and Power of a Commonwealth* (1651). Other works are *De Cive* (1642), *De Corpore Politico* (1650), *De Libertate, Necessitate et Casu* (1654), and *Behemoth*, a history of the Civil war, published after his death. He also published a metrical version of the *Iliad* and *Odyssey*. In the history of the development of freethought in Europe Hobbes holds an important place, and he was one of the first great English writers on government. He conceived the state of nature to be one in which all things are at war with one another, and government as the result of a compact, suggested by selfishness, for the sake of peace and protection. Absolute rule was the best form of government, but this is qualified by the assertion that obedience to a ruler is due only so long as he can afford protection to the subject. His philosophy, depreciated among his contemporaries, was more or less adopted by Locke, Hartley, Hume and Priestly.

Hoboken (hō'bō-ken), a city of New Jersey, on the Hudson River, and close to Jersey City, which extends immediately to the south. It lies opposite New York, with which it is connected by steam ferries. It is the terminal of the Lackawanna Railroad, and is served by several others. It has various manufactories, and five lines of European steamers sail from this port. Among the public institutions is the Technical Institute. Pop. 75,000.

Hobson (hob'sun), RICHMOND PEARSON, naval officer, was born at Greensboro, Alabama, in 1870, and graduated from the naval academy in 1891. During the 1898 war with Spain he took a collier, the *Merrimac*, into the entrance of Santiago harbor, and sunk her in the channel, with the purpose of closing it against the Spanish squadron

in the harbor. He and his companions escaped in a small boat and surrendered to the Spanish commander. For this he was promoted first naval constructor. He resigned and was elected to Congress, 1906, where he strongly insisted on the danger of war with Japan.

Hobson's Choice, a choice without an alternative; that which is tendered, or nothing; the one thing or none. This phrase is said to have originated from one Hobson, a livery-stable keeper at Cambridge, England, who obliged each customer requiring the hire of a horse to take the next in turn, or that which stood nearest the stable-door.

Hoche (ōsh), LAZARE, general in the French revolutionary war, born in 1768. He took service in the French guards when sixteen years old, and at the revolution joined the popular party. He greatly distinguished himself at the siege of Thionville and the defense of Dunkirk, and shortly afterwards, when scarcely twenty-five years of age, received the command of the army on the Moselle. In 1793 he drove the Austrians out of Alsace, and soon after was arrested by the Jacobins and imprisoned at Paris. In 1794 he was released, and appointed commander of the army destined to quell the rising in the west, and afterwards to that in La Vendée. In 1796 he conceived the plan of attacking Britain, by making a descent on Ireland. He accordingly set sail in December from Brest, but the expedition utterly failed, and he was obliged to return without having even effected a landing. After his return he received the command of the army of the Sambre and Meuse. He opened the campaign of 1797 by a bold passage over the Rhine, and had defeated the Austrians in several engagements, when he was stopped in the path of victory by the news of the armistice concluded in Italy. He died suddenly in September of the same year (1797).

Hochst (hökst), a town of Prussia, in Hesse-Nassau, 6 miles W. of Frankfort. It has varied industries. Pop. 14,121.

Hochstädt (hōh'stet), Bavaria, the scene of battle of Blenheim in 1704. Pop. 2471.

Hock, the name given to the German wines grown in the Hochheim district. It is a white still wine, but is sometimes rendered sparkling. The name is also applied to all the Rhenish wines.

Hockey (hok'i), a game at ball known as *shinty* in Scotland, and *hurling* in Ireland. It is played with a club curved at the lower end, by a number of persons divided into two parties or sides; and the object of each side is to drive the ball into that part of the field marked off as their opponents' goal. In Canada and the northern United States it is played commonly in the winter on ice.

Ice Hockey, however, is more scientific than the old shinty and arose in Canada about 1880. It was introduced into the United States by some of these Canadian college players (1894–95), and the game has become very popular in America. The game requires a rink 112 ft. long and 58 ft. broad, and boundary boards, preferably 36 in. high, for carroming. A vulcanized rubber disc, 1 in. thick and 3 in. in diameter, known as a puck, is advanced by pushing or lifting with hockey sticks about four feet long, terminating in a blade set at an angle of about 45° with the haft. This blade may not be more than 3 inches wide. The object of the game is to drive the puck into the opponents' goal, which counts as one goal. The goals consist of pockets of netting extending back from posts and are six feet wide and four feet high. The players are seven in number, consisting of four forwards and three for defense.

Hoe (hō), an instrument for cutting up weeds and loosening the earth in fields and gardens, in shape something like an adze, being a plate of iron, with an eye for a handle, which is set at a convenient angle with the plate. The Dutch hoe differs from the common hand hoe in having the cutting blade set like the blade of a spade. A *horse-hoe* is a frame wheel-mounted, and furnished with ranges of shares spaced so as to work in the intervals between the rows of turnips, potatoes, etc. It is used on farms for the same purpose as the hand hoe, and worked by horse-power.

Hoe, RICHARD MARSH, inventor, born at New York in 1812; died in 1886. He invented in 1846 a rotary printing press, and subsequently the Hoe web-perfecting press. These inventions made a revolution in the art of newspaper printing, to which they were specially adapted.

Hof (hōf), a town in Bavaria, Upper Franconia, on the left bank of the Saale, 30 miles N. N. E. of Baireuth. It has woolen, linen, cotton, leather and paper manufactures. Marble and ironstone are worked in the vicinity. Pop. (1910) 41,126.

Hofer (ho'fer), ANDREAS, a Tyrolese patriot, born in 1767. In 1796 he led a rifle company against the French on Lake Garda, and after the Peace of Lunéville took a prominent part in the

organization of the Tyrol militia. In 1809 he took the lead in an insurrection of the Tyrolese for shaking off the yoke of Bavaria, to which their country had been transferred by the Treaty of Presburg. In a short time, with intermittent assistance from the Austrians, he defeated the French and Bavarian troops, and nearly the whole country was liberated. Hofer then carried on the military and civil administration, under the most singular circumstances, till the Peace of Vienna was proclaimed. Misled by false reports he commenced hostilities anew, and thus forfeited the protection of the amnesty. He remained concealed for some time, but was at last betrayed to the French, and carried to Mantua, where he was tried by a court-martial and shot, February 20, 1810. His family was indemnified for the loss of their property by the Emperor of Austria in 1819, and his son ennobled.

Hoffman (hof'man), CHARLES FENNO, poet and novelist, born at New York in 1806; died in 1884. He edited the *American Monthly Magazine* and the *New York Mirror;* published *Greyslaer*, a novel; *The Vigil of Faith, and other Poems;* and a number of songs, etc. During the last thirty years of his life he was afflicted with mental derangement. A complete edition of his poems was published by his nephew in 1874, with a critical introduction by W. C. Bryant.

Hoffmann, AUGUST HEINRICH, called also HOFFMANN VON FALLERSLEBEN, a German lyric poet and philologist, born at Fallersleben in Hanover in 1798; died at Corvey in 1874. Under the influence of the brothers Grimm he took to investigating old German literature, and became professor of German literature at Breslau in 1835. He also made special studies of Dutch and Silesian literature. He was dismissed in 1842 for the supposed revolutionary tendencies of his songs, and led a wandering life for some years. In 1860 he became librarian to the Duke of Ratibor. He published several volumes of songs, and works on the German language and literature.

Hoffmann, ERNST THEODOR AMADEUS, or, properly, ERNST THEODOR WILHELM, a German novelist, was born at Königsberg in 1776, where he studied law. He afterwards held several minor judicial appointments under government, and died in 1822, intemperate habits having ruined his health. He cultivated music and art, especially caricature, with success. Among his works of fiction are the *Phantasiestücke in Callot's Manier* (1814); *Die Elixire des Teufels* (1816); the *Nachtstücke* (1817); the *Serapionsbrüder*, etc.

Hofmann, JOSEPH, celebrated pianist, was born at Cracow, Gallicia, in 1877, and became so proficient under the tutelage of his father, who was a capellmeister and composer, that at the age of 10 he made a concert tour of America. The infant prodigy developed into a brilliant player following a period of retirement and further study in Europe. He returned to the United States in 1901 and made an instant success.

Hog, a general name for the ungulate or hoofed animals of the genus *Sus*, or swine. The head is prolonged into a pointed or truncated snout; the feet have four toes, two of which reach the ground, and the skin is very thick, and mostly covered with stiff bristles. The common hog (*Sus scrofa*), in a tame state, is almost universal, except in very high latitudes. The prevailing color of the domestic animal is a dull yellowish white, sometimes marked irregularly with black and sometimes totally black. It is omnivorous in its habits, devouring almost any vegetable or animal substance. It is also very prolific, has usually two litters in a year, a litter consisting of from ten to even twenty. Its flesh forms a material part of the food of mankind, though Jews are strictly enjoined not to eat it, and Mohammedans agree in this prohibition. Pork takes salt better than almost any other meat, and hence forms an important article in military and naval stores. The lard of the hog is employed in a variety of preparations, and the bristles are used in large quantities in the manufacture of brushes, while the skin, when tanned, is used by saddlers, bookbinders, etc. The hog is erroneously looked on as a peculiarly stupid and gluttonous animal; it has also an undeserved reputation for filthy habits, but the too common filthiness of pig-sties is more the fault of the owner than the tenant. It wallows in the mire, but this is a peculiarity of the pachydermata, to cool themselves and provide a protection against insects. The wild-boar, from which most of our domesticated varieties are derived, is found in most parts of Europe and Asia. In size the wild animal considerably exceeds the domesticated hog, the legs are longer and more muscular, and the back therefore much higher. Hunting this animal has always been a favorite amusement, and can still be practiced in various parts of Europe. The wild hogs of Hindustan, which afford the amusement of 'pig-sticking' to the British resident there, belong to the species *S.*

cristatus, closely allied to the European wild-boar. Another species is found in Southeastern Asia, Java and various islands, and distinct from it is the Guinea hog of W. Africa, which is also said to have been naturalised in Brazil. As allied to the hog may be mentioned the *Babyrousses*, the genus *Phacochœrus*, or wart-hogs and the peccaries. In 1910 there were on American farms 44,158,000 hogs; 56,044,000 in 1912; 55,298,000 in 1914. On March 31, 1918, there were on American farms 74,324,000 hogs, valued at the enormous sum of $2,500,000,000, by far the greatest number produced in a single year. Hog cholera (see *Swine Fever*) was up till recently responsible for heavy loss among swine, but thanks to the efforts of Congress the disease is gradually being stamped out. Constantly increasing appropriations of Congress permitted the cholera-control demonstration work to be extended to thirty-five states in 1918. The loss in 1914 from hog cholera was 119 per thousand; this was reduced in 1917 to 42 per thousand, a saving of $45,000,000. According to the Federal Bureau of Crop Estimates, the mortality due to hog cholera in 1917 was the lowest ever recorded in America. The profitable production of hogs demands dry, sanitary, comfortable housing. The movable type of hog house.

Hogarth (hō'garth), WILLIAM, painter and satirical artist, born at London in 1697; died in 1764. He was apprenticed to a silversmith, who employed him in engraving ciphers and crests on spoons and pieces of plate. In 1720 he commenced business for himself, painting portraits, and making designs and book-plates for the booksellers, etc. Among these was a series of illustrations to Hudibras. Besides portraits, he also painted miscellaneous subjects in oil. In 1729 he married the daughter of Sir James Thornhill, the painter, against her father's wishes, who is said, however, to have been mollified when Hogarth produced his celebrated series of pictures called the *Harlot's Progress*, a work which brought his great powers fairly before the public. The engravings of these, which became exceedingly popular, were published in 1731. This was followed by the *Rake's Progress* and *Marriage à la Mode*, two similar series of paintings and engravings; *Industry and Idleness*, *Beer Street and Gin Lane*, *The Election*, *The Enraged Musician*, *The Country-Inn Yard*, *The March to Finchley*, *Strolling Actresses Dressing in a Barn*, *Four Stages of Cruelty*, and a host of other engravings, which all evinced his extraordinary powers of satire, wit and imagination. Several portraits, notably those of himself, Garrick, Lovat and Wilkes, are masterpieces in their way. He was also ambitious of shining as an historical painter, but in this line he was not so successful. In 1753 his work on the *Analysis of Beauty* appeared, a treatise which brought him little fame, and which was severely ridiculed by his enemies and professional rivals. In originality of imagination and invention, and for vigor of realism and dramatic power, Hogarth stands in the highest rank, and his genius was always enlisted on the side of virtue and morality. Though best known as an engraver, he possessed high qualities as a painter. The best edition of his works is that published by Boydell (London, 1790), the plates of which, retouched by Heath and others, have been repeatedly published since.

Hog-deer. See *Axis*.

Hog-fish, the popular name given to teleostean fishes of the genus *Scorpæna*, family Scorpænidæ or Triglidæ. The best known species is the *S. scrofa*, common in the Mediterranean, having the head flattened sideways, armed with spines, and adorned with membranous lobes or filaments. It is of a large size and a red color.

Hogg, JAMES, more familiarly known by the name of the *Ettrick Shepherd*, was born in Selkirkshire, Scotland, in 1770; died at Altrive, on the Yarrow, in 1835. After receiving a very scanty education, he began to earn his bread by daily labor as a shepherd. His early rhymings brought him under the notice of Sir Walter Scott, by whose advice he published a volume of ballads under the title of *The Mountain Bard*. The failure of an ill-judged agricultural scheme brought him to Edinburgh, where he published the *Forest Minstrel* (1810), and started a weekly periodical entitled *The Spy*, which, after a short time, became defunct. The appearance of the *Queen's Wake*, in 1813, with its charming ballad of *Kilmeny*, established Hogg's reputation as a poet. In 1815 he published his *Pilgrims of the Sun*, which was followed by *Mador of the Moor*, the *Poetic Mirror* (a collection of imitations of living poets), *Queen Hynde*, and *Dramatic Tales*, as well as by *The Brownie of Bodsbeck*, and other prose tales; the *Jacobite Relics* (partly written by Hogg), etc. From 1817 he had held the farm of Altrive from the Duke of Buccleuch at a merely nominal rent; but his farming schemes never throve, and he was generally in narrow circumstances.

Hog Island, a small tract of land, southwest of Philadelphia, which became famous during the great war of 1914-18. Here, in September, 1917, was established under the direction of the United States Shipping Board, the largest shipbuilding plant in the world. There were 50 slipways extending over a mile of water front. Outfitting piers, 1000 feet long, were also built. The land taken over by the government was 846 acres of virgin soil.

Hog-plum, the popular name of the plants belonging to the genus *Spondias*, nat. order Anacardiaceæ. Some of the species yield pleasant fruits, as *S. purpurea* and *S. lutea* of the West Indies, the species generally called hog-plum, because their fruit is a common food for hogs.

Hogshead, measure of capacity containing 63 old wine gallons, or 52½ imperial gallons. For beer it was 54 gallons, for rum 45 to 50 gallons, for brandy 45 to 60 gallons. Now seldom used in Britain, in the United States the word has come to signify a large cask. For tobacco it varies from 750 lbs. in some states, to 1200 lbs. in others.

Hohenlinden (hō-en-lin'den), a village of Bavaria, 20 miles east of Munich, celebrated for the victory gained by the French under Moreau over the Austrians under the Archduke John, December 3, 1800.

Hohenlohe (hō'en-lō-e), formerly a principality of Germany, containing 680 square miles, now chiefly under the sovereignty of Würtemberg, and partly under that of Bavaria.

Hohenstaufen (hō'en-stou-fn), a German princely family, several members of which filled the imperial throne. The founder of the family was Frederick, lord of Hohenstaufen, a castle in the Suabian Alps, who, for his services to the Emperor Henry IV, received the duchy of Suabia, and the hand of his daughter Agnes. His son Conrad was elected emperor in 1138. After the death of Conrad (1152) the confidence which was felt in the Hohenstaufen family caused the choice to fall on his nephew, Frederick III of Suabia, who was followed by Henry VI (1190), who added by his wife the kingdom of Sicily and Naples to the hereditary dominions of the family; and he again by Otto IV (1197) and Frederick II (1215-50), all belonging to the same house. After the death of Frederick II his son Conrad was acknowledged as his successor, with the title of Conrad IV, by most of the states of the empire; but Innocent IV laid him under an interdict, declared him to be deprived of all his lands, and persecuted him with relentless hatred till his death in 1254. The possessions of the family ultimately fell to Bavaria, Baden and Würtemberg.

Hohenstein-Ernstthal (hō'en-shtīn ernst'tāl), a town in Germany, kingdom of Saxony, 12 miles N.E. of Zwickau. Pop. (1910) 15,632.

Hohenzollern (hō-en-tsol'ern), two united principalities of Germany, since 1852 an administrative division of Prussia. It consists of a long, narrow, irregular strip of country, entirely surrounded by Würtemberg and Baden. Area, 441 square miles. Pop. 71,000. The princely family of Hohenzollern dates from Tassillon, who lived under Charlemagne, 800 A.D. There have been several lines and branches, the main one being represented by the last emperor of Germany, William II (q. v.).

Höhscheid (hē'shīt), commonly Rhenish province, Prussia, W. of Barmen. Its industries include lead-mining, and the manufacture of cutlery and hardware. Pop. (1910) 16,083.

Hokusai (hō'kō-sī), a celebrated Japanese painter, born at Honjo in Yedo (now Tokio) in 1760; died in 1849. No less than 30,000 drawings are accredited to him.

Holacanthus. See *Coral Fishes.*

Holbach (hol'bäk), Paul Heinrich Dietrich, Baron von, philosopher, born at Heidelsheim, in the Palatinate, in 1723; died in 1789. In Paris he became the patron and associate of the encyclopædists, and contributed many papers to the *Encyclopédie.* The principal work attributed to him, which appeared under the name of M. Mirabaud, is the *Système de la Nature.* He afterwards published *Système Social, or Principes Naturels de la Morale et de la Politique: Bons Sens,* or *Idées Naturelles opposées aux Idées Surnaturelles*—a sort of atheist's catechism; *Eléments de la Morale Universelle;* etc., etc. According to Holbach's teaching matter is the only form of existence, and everything is the effect of blind necessity.

Holbein (hol'bīn), Hans, an eminent German painter, born at Augsburg in 1497. He studied under his father, Hans Holbein the elder, a painter of considerable merit (1450-1526), and at an early age settled at Basel, where he exercised his art till about 1526. He then came to England, where letters from his friend Erasmus,

whose *Panegyric on Folly* he had illustrated by a series of drawings, procured him the patronage of the chancellor Sir Thomas More. He was appointed court painter by Henry VIII; and painted many celebrities. His paintings include a

Hans Holbein the younger

Madonna at Darmstadt (better known through the replica at Dresden), representing the Burgomaster Meyer and his wives kneeling to the Virgin; and the *Solothurn Madonna*. His famous *Dance of Death* has been preserved only in the engravings of Lützelburger. There are a considerable number of engravings on wood and copper from Holbein's designs. He died at Whitehall of the plague in 1543.

Holberg (hol'berg), Ludwig, Baron, the father of modern Danish literature, was born at Bergen, in Norway, then part of the Danish dominions, in 1684; died at Copenhagen in 1754. He studied at the University of Copenhagen, and afterwards traveled through a good part of Europe, spending some time in Oxford, where he taught music and modern languages, and studied modern history and philosophy. In 1718 he was appointed to an ordinary professorship in the University of Copenhagen, where after this date he chiefly resided till his death. In 1735 he was elected rector, and in 1737 treasurer of the university in which he held his professorship, and in 1747 he was raised to the rank of baron. His works may be divided into four classes—poems, stage pieces, philosophical treatises and historical works. His poems are chiefly of a satirical nature. The most celebrated is *Peder Paars*, a comic heroic poem in fourteen cantos, which is still regarded throughout the Scandinavian countries as a masterpiece. Almost equally famous is his *Nicolas Klimm's Subterraneous Travels*, a satirical romance in prose. His stage pieces are all either comedies or farces, and are nearly all characterised by true comic power. Among his philosophical writings the most important is his *Moral Reflections* (1744). His historical works include *The Political, Ecclesiastical, and Geographical Condition of the Danish Monarchy*, *A General History of the Jews*, and *A History of Famous Men and Famous Women* (1739-45).

Holcus (hol'kus), a genus of grasses (nat. order Gramineæ) extremely common in some pastures, where they are called soft grasses. Whether because of their innutritious quality, or of the soft hairs with which they are covered, they are neglected by cattle. *H. saccharatus* contains a large quantity of sugar, and *H. odorātus* is celebrated for its fragrance. *H. lanatus* is the only North American species.

Hold (hōld), the whole interior cavity or belly of a ship, or all that part of her inside which is comprehended between the floor and the lower deck throughout her length.

Holden, Edward Singleton, astronomer, born at St. Louis, Missouri, in 1846. He was professor of mathematics at the Naval Academy, 1873-81; president of the University of California, 1883-88; director of the Lick Observatory, 1888-98; afterwards astronomer of the Smithsonian Institution, and since 1901 librarian of the United States Military Academy. He has written many papers on astronomical and other subjects.

Holibut. See *Halibut*.

Holiday (hol'i-dā), any day set apart as a religious or national festival; in a general sense a day or a number of days during which a person is released from his everyday labors. In Britain certain days were fixed as bank-holidays by Parliament in 1871, and it was enacted that all business transactions which would have been valid on any such holiday shall be held as valid if performed on the day following. In most sections of the United States the holidays are New Year's Day, Lincoln's Birthday, Washington's Birthday, Good Friday, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas. Other countries have patriotic holidays of historical significance to them, with various church and other holidays, while New Year's Day, Good

Friday and Christmas are kept as holidays throughout Christendom.

Holinshed (hol'ins-hed), RAPHAEL (RALPH), an English chronicler of whom nothing more is known than that he was descended from a family originally belonging to Cheshire, that he lived in the age of Queen Elizabeth, and that he died about 1580. He is only known by his *Chronicles of Englande, Scotlande and Irelande*, the first edition of which, known as the 'Shakespere edition,' because it is the one which is supposed to have been used by him in collecting material for his historical plays, was published in London in 1577. In the preparation of this work Holinshed was assisted by several of the most learned men of the day.

Holkar (hol'kär), the family name of the Maharajahs of Indore.

Holl (hol), FRANK, portrait and subject painter, son of Francis Holl, an eminent engraver, was born at London in 1845; died in 1888. He was a very successful student at the Royal Academy, and exhibited constantly from his student days. Among his best-known pictures are *Faces in the Fire*, *Fern-gatherers*, *No Tidings from the Sea*, *Leaving Home*, and *Gifts of the Fairies*. Later he devoted himself to portraiture, in which he greatly excelled, and painted many of the celebrities of the day.

Holland (hol'land), a fine and close kind of linen, so called from its first being manufactured in Holland; also a coarser linen fabric, unbleached or dyed brown, used for covering furniture, carpets, etc.

Holland, a city of Ottawa County, Michigan, 25 miles S. W. of Grand Rapids. It has extensive leather works, large woodenware and furniture factories, etc., and is a prominent grain market. It is the seat of Hope College and Western Theological Seminary. Pop. 12,000.

Holland, HENRY RICHARD VASSALL FOX, THIRD LORD, born in 1773; died in 1840. He succeeded to the peerage by the death of his father when less than one year old. In 1798 he took his place in the House of Lords, and as the nephew of Charles James Fox was at once acknowledged as a Whig leader, and a very able orator. In 1806 he was commissioner for settling disputes with the United States; lord privy seal in 1806-07; and chancellor of the Duchy of Lancaster. He wrote *Life of Lope de Vega* and *Foreign Reminiscences*, published *Three Comedies from the Spanish*, and made Holland House the resort of the wit, talent and beauty of his day.

Holland, JOSIAH GUILBERT, author and editor, was born at Belchertown, Massachusetts, in 1819. In 1844 he was graduated at the Berkshire Medical College, but in his practice received but little encouragement. At the age of 30 he connected himself with the Springfield *Republican*. Dr. Holland exhibited remarkable aptitude for journalism, and the paper soon became vastly popular. As an author many of his works were very successful, with immense sales. Prominent among them were *Bitter-sweet, a Dramatic Poem; Sevenoaks*, *Miss Gilbert's Career*, and *Nicholas Minturn*, novels, and *History of Western Massachusetts*. In 1870 Dr. Holland began editing *Scribner's Monthly*. He died in 1881.

Holland, KINGDOM OF. See *Netherlands*.

Holland, NEW, the name formerly given to the island or continent of Australia.

Holland, NORTH (*Noordholland*), and HOLLAND, SOUTH (*Suidholland*), two provinces of the Netherlands. The greater part of the former consists of a peninsula, bounded by the North Sea on the W. and the Zuider Zee on the E. Area, 1054 sq. miles. It lies very low, some portions of it being at least partially below the level of the sea, and is generally fertile. A broad margin of downs or sand-hills protects it from the sea on the west. Besides rivers (Vecht, Amstel, Zaan, etc.), it is intersected by the Great North Holland Canal. The chief towns are Amsterdam, Alkmaar, Haarlem, Helder, Zaandam. Pop. 968,104.—SOUTH HOLLAND, the most populous province of the Netherlands, is bounded on the north by North Holland, on the west by the German Ocean. The southern part of the province is broken up into several islands. Area, 1155 sq. miles. Like North Holland, it is a flat and depressed tract, and it also is protected from the sea on the west by a margin of downs or sand-hills. The chief river is the Rhine, with its numerous branches. The lakes were formerly numerous, but most of them are now drained. The soil is fertile and well cultivated. The principal towns are Delft, Dort, Gorkum, Gouda, Leyden, Rotterdam, Schiedam's Gravenhage (The Hague). Pop. 1,144,448. See *Netherlands*.

Holland, PHILEMON, physician, teacher, and 'translator-general of his age,' born at Chelmsford, England, in 1551; died in 1636. He became master of the free grammar school of Coventry, and also practiced as a physician. His translations include Livy,

Pliny, Plutarch's *Morals*, Suetonius, Xenophon, etc., and he published an edition, with additions, of Camden's Britannia.

Hollands. See *Gin*

Hollar (hol'lär), Wenzel or Wenceslaus, a Bohemian engraver, born at Prague about 1607; died at London in 1677. He accompanied the Earl of Arundel, the British ambassador to the German emperor, to London, who employed him to engrave some of the pictures of his collection. Among his numerous works, which are esteemed for their delicate, firm, and spirited execution, and which number some 2740 plates, is a set of twenty-eight plates, entitled *Ornatus Muliebris Anglicanus*, representing the dresses of Englishwomen of all ranks and conditions in full length figures; Holbein's *Dance of Death*, etc.

Hollow Ware, the trade term for all kinds of vessels made of cast or wrought iron, and used for cooking and other purposes.

Holly (hol'i; *Ilex*), a genus of plants of the order Aquifoliaceæ, embracing a number of evergreen trees or shrubs. The common holly (*I. aquifolium*) is a native of Europe. It is a handsome, conical evergreen tree, growing to the height of 20 or 30 feet. Its leaves are dark-green, shining, and leathery, abundantly armed with prickles on the lower branches, but free from them on the upper, or on very old trees. The flowers are white, appearing in May. the fruit is red, ripening in September, and remaining on the tree all the winter. It is excellently adapted for hedges and fences, as it bears clipping. The wood is hard and white, and is employed for turnery work, knife handles, etc. The bark yields a mucilaginous substance, from which birdlime is made. Among the Romans it was customary to send boughs of holly to friends, with new-year's gifts, as emblematical of good wishes; and it is used to decorate houses at Christmas. The American holly (*Ilex opaca*) is widely diffused throughout the United States. It sometimes attains the height of 80 feet, with a trunk 4 feet in diameter. The *I. glabra* is another species of holly, inhabitating the coast regions of the United States. Its leaves furnished the 'black drink' which used to hold an important place in Indian ceremonies. The maté or Paraguay tea-plant is a species of holly (*I. Paraguayensis*).

Hollyhock (hol'i-hok), a perennial plant. (*Althæa rosea*), nat. order Malvaceæ. It is a native of Greece, and is a frequent ornament of gardens. There are many varieties, with single and double flowers, characterised by the tints of yellow, red, purple and dark purple approaching to black. It reaches a height of 8 feet or more.

Holmes (hōmz), Mary Jane (née Hawes), American author, born at Brookfield, Mass., in 1839; died 1907. She was one of the most popular of American novelists, over 2,000,000 copies of her books having been sold. Among her novels are *Dora Deane*, *Marion Gray*, *The Cromptons*.

Holmes (hōmz), Oliver Wendell, writer, born at Cambridge, Massachusetts, in 1809, and educated at Harvard University. He began the study of law, but in a short time relinquished it for that of medicine. In 1839 he became professor of anatomy and physiology in Dartmouth College, New Hampshire, but resigned after two years' service in order to devote himself to practice in Boston. In 1847 he was appointed to the chair of anatomy at Harvard, a position which he filled till 1882. As an author he was prolific both in prose and verse, and shone as a prominent figure in the famous group associated with the *Atlantic Monthly*. His chief works, besides several volumes of poems, and treatises on medicine, are *The Autocrat of the Breakfast Table*, *The Professor at the Breakfast Table*, and *The Poet at the Breakfast Table*; *Elsie Venner*, *The Guardian Angel*, *A Mortal Antipathy* and *Memoirs of Motley* and *Emerson*. He died October 7, 1894.

Holmes, Oliver Wendell, son of the above, born at Boston 1841; graduated from Harvard in 1861; from Harvard Law School in 1866; served in the Civil War, and was wounded at Ball's Bluff, Antietam and Fredericksburg. In 1867 he was admitted to the Massachusetts bar; became professor of law at Harvard 1882; chief justice Supreme Court of Massachusetts 1899–1902; associate justice Supreme Court of the United States 1902.

Holmes, William Henry, American geologist, born in Harrison County, Ohio, in 1846. In 1872 he became first assistant and then (1889) geologist to the United States Geological Survey. Since October, 1902, he has been chief of the Bureau of American Ethnology.

Holm-oak, *Quercus Ilex*, a shrub-like tree, native of the Mediterranean countries, with holly-like leaves. In its native countries it attains a considerable size and age.

Holofernes (hol-o-fer'nēz). See *Judith*.

Holograph (hol'u-graf), any writing, as a letter, deed, will, etc., wholly written by the person from whom it bears to proceed. In Scots law a holograph deed is valid without the signatures of witnesses, but in English law every deed, whether holograph or not, must have the names of two witnesses attached to it to render it valid. The rule as to witnesses varies in the various states of this country.

Holoptychius (hol-op-tik'i-us), a genus of fossil ganoid fishes occurring in the upper old red sandstone. The head was covered with large plates, and the body with bony scales, rhombic or cycloid in form. The jaws, besides being armed with numerous sharp-pointed fish-teeth were furnished with large teeth of a conical form.

Holothuria (hol-o-thū'ri-a), the type of an order of Echinoderms, the *Holothurioidea* or sea-cucumbers. This order is destitute of the calcareous plates typical of the class, but has a leathery integument open at both ends, and pierced by orifices through which suctorial feet or ambulacra protrude. They have the mouth surrounded by tentacula; a long convoluted alimentary canal; respiratory organs near the anus, and generally in the form of two branching arborescent tubes (forming the 'respiratory tree') into which the water is admitted; and the organs of both sexes in each individual. They are capable of extending themselves to several times the length they have in a state of repose, and of extraordinary reproduction of parts, even of vital organs. The young undergo a metamorphosis during development. They abound in the Asiatic seas, the bêche-demer or trepang being a member of the family, and highly esteemed in China as an article of food.

Holst, Hermann, Eduard von, historian, born at Fellin, Livoisia (Russia), in 1841; removed to New York in 1864; was subsequently professor of history at Strasburg and Freiburg. He wrote a very able *Constitutional History of the United States*, also *Constitutional Law of the United States*, and *Life of J. C. Calhoun*. He died in 1904.

Holstein (hōl'stin). See *Schleswig-Holstein*.

Holster (hōl'ster), a leathern case for a pistol, carried by a horseman at the fore part of his saddle, and frequently covered with wool or fur.

Holy Alliance, a league concluded at Paris, September 26, 1815, between Alexander I, emperor of Russia, Francis of Austria, and Frederick William III of Prussia, and signed with their own hands, and without the countersign of a minister. It consisted of a declaration, that, in accordance with the precepts of the gospel of Jesus Christ, the principles of justice, charity, and peace should be the basis of their internal administration, and of their international relations, and that the happiness and religious welfare of their subjects should be their great object. Its real aim, however, was to maintain the power and influence of the existing dynasties, and its methods were by no means in accordance with its title. It was offered for signature to all the European powers except the pope and the sultan of Turkey, and accepted by all except Britain. Its purpose of aiding Spain in subduing her American colonies, with the idea of acquiring for its members territory in America, was a leading cause of the promulgation of the Monroe Doctrine, which put a definite end to the scheme. The events of 1848 broke up the Holy Alliance.

Holy Coat of Treves, a relic preserved in the cathedral of Treves, and claimed to be the identical seamless coat worn by Jesus at his crucifixion, and for which the soldiers cast lots. It is said to have been brought from Palestine by the Empress Helena.

Holy Cross, College of the, a Roman Catholic college at Worcester, Mass.; controlled by the Fathers of the Society of Jesus; founded in 1843. In 1914 it had 573 students.

Holy Cross Mountain, situated in Colorado, in the heart of the Rocky Mts., about 15 m. N. W. of Leadville; height, 14,000 feet.

Holy Ghost, according to Trinitarians, the third Person in the Holy Trinity; according to the Socinians, a Biblical metaphor, to designate the divine influence. The doctrine of the Athanasian creed adopted by Roman Catholics, Lutherans, and Calvinists alike, is that the Holy Ghost proceeded from both Son and Father, and is coeternal and equal with both. The Eastern Church, however, following the Council of Alexandria held in 362, asserts that the Holy Ghost proceeds from the Father alone.

Holy Ghost, Order of, an order of male and female hospitallers, founded by Guy, son of William, Count of Montpellier, towards the end of the twelfth century, for the relief of the poor, the infirm and foundlings. After the middle of the eighteenth century it was united with the order of St. Lazarus by Clement XIII. This was also the

name of the principal military order in France instituted in 1578 by Henry III, abolished in 1789, revived at the Restoration, and again abolished in 1830.

Holy Grail. See *Grail*.

Holy Grass, *Hierochlöe*, an odoriferous genus of grasses belonging to the Phalarideæ, and consisting of several species spread over the cold parts of both hemispheres. The *H. borealis*, or northern holy grass, is found in Scotland, Iceland, and throughout Northern Europe, Asia and America, and occurs also in New Zealand. It has its name from the practice adopted in some parts of Germany of strewing it before the doors of churches on festival days.

Holyhead (hol'i-hed), an island and seaport town of North Wales, in the county of Anglesey. The island is about 7 miles long and 5 miles broad at the widest part, is situated on

the west side of Anglesey, and is connected with the mainland by a causeway. The town is on the northeast side of the island, and owes its prosperity to the railway and steamboat traffic between England and Dublin. The harbor of refuge (Victoria Harbor), opened in 1873, is formed by a breakwater which is 7860 feet in length. Ropemaking and shipbuilding are leading industries. Pop. 10,688.

Holy Island, or LINDISFARNE, an island of the northeast coast of England, 11 miles southeast of Berwick. It is 1¾ miles from the mainland, with which it is connected by a narrow neck of sand, traversable at low water. It is of an irregular form, about 2½ miles in length, and about 1½ miles in breadth at the broadest part. The village of Lindisfarne on the s. w. is much resorted to by summer visitors, but the great object of interest is the extensive ruined abbey of Lindisfarne, founded in 634 by Oswald, king of Northumbria, destroyed by the Danes, and restored by the Normans in 1093.

Holyoake (hōl'yōk or hō-li-ōk'), GEORGE JACOB, English social reformer, born at Birmingham, 1817; died, 1906. In 1837 he fell under the influence of Robert Owen, and became (1841) one of his most active 'social missionaries.' His later years were devoted to the spread of secularism.

Holyoke (hōl'yōk), a city of Hampden county, Massachusetts, on the W. bank of the Connecticut River, 8 miles N. of Springfield. It is a prosperous manufacturing place, its rise dating from 1849, when a dam constructed across the river, which here falls 60 feet in the course of a mile, supplied it with extensive water power. It is extensively engaged in the manufacture of woolen and cotton goods, paper, thread, machinery and various other articles. Its paper industry is one of the largest in the world, and the textile works are very large. Pop. 63,000.

Holy Orders. See *Orders, Holy*.

Holy Places of Jerusalem, a term meant to apply more particularly to that group of localities of which the Church of the Holy Sepulchre is the center, some of the other more celebrated objects being the Garden of Gethsemane, the Church of the Ascension, the Tomb of the Virgin, etc., all connected with the life and passion of our Saviour. The guardianship of the holy places has been a cause of much contention between the Greek and Latin churches. They were formerly under the control of the latter, but since 1757 they have been committed to the care of the Greek Church by imperial ordinance of the Porte. Demands made respecting the holy places and the protection of Greek Christians in Turkey, led to the Crimean war of 1854-56.

Holy Roman Empire, a title which the German Empire received in 962 when Otho I was crowned at Rome by Pope John XII. It came to an end when Francis II became hereditary emperor of Austria in 1804.

Holyrood (hol'i-rōd), PALACE AND ABBEY OF, in Edinburgh, at the eastern extremity of the old town. The abbey church, founded in 1128 by

David I, containing the royal vault, with the ashes of numerous members of the Scottish royal race, is now mostly in ruin. The palace is a large quadrangular building of hewn stone, with a court within surrounded by a piazza. It was erected in successive parts from 1501 to 1679, contains the private royal apartments in modernized condition, the rooms associated with the events in the reign of Mary, Queen of Scots, and a gallery 150 feet long, in which are portraits of all the Scottish kings, most of them imaginary. The abbey and its precincts possess the privilege of sanctuary for insolvent debtors, but the class of debtors entitled to sanctuary has been so restricted by recent legislation that the institution may be looked upon as obsolete.

Holy Sepulcher, Knights of the, a military order of knighthood founded by Godfrey of Bouillon, 1099, for the guardianship of the Holy Sepulcher at Jerusalem and for the protection of pilgrims. It was revived by Pope Alexander VI. 1496, and reorganized in 1847 and 1868.

Holy Spirit Plant, an orchidaceous plant (*Peristeria elata*) of Central America, known also as the *dove-plant*, from the resemblance of the united stamens and pistil of the flower to a dove hovering with expanded wings, somewhat like the conventional dove seen in artistic representations of the Holy Ghost. It has a spike of almost globose, sweet-scented flowers of a creamy white, dotted with lilac on the base of the lip.

Holy Thursday, Ascension-day, in the Anglican Church, a movable feast, always falling on the Thursday but one before Whitsuntide. In the Roman Catholic Church, the Thursday in Holy Week. See *Holy Week*.

Holy Wars. See *Crusades*.

Holy Water, in the Greek and Roman Catholic churches, salted water which has been consecrated by prayers, exorcism, and other ceremonies, to sprinkle the faithful and things used for the church. It is placed at the door of churches, so that worshipers may sprinkle themselves with it as they enter, and it is used in nearly every blessing which the church gives. Sprinkling the people with holy water seems to date from the ninth century, and it is considered efficacious not from any virtue of its own, but from the effect of the church's prayers at the time of using.

Holy Week, PASSION WEEK, is that which immediately precedes Easter, and is devoted especially to commemorate the passion of our Lord. The days more especially solemnized during it are Spy Wednesday, Maundy Thursday, Good Friday and Holy Saturday. It is an institution of very early origin, and is known as Great Week, Silent Week, Penitential Week, etc. Spy Wednesday was a name given in allusion to the betrayal of Christ by Judas Iscariot. Maundy or Holy Thursday especially commemorates the institution of the Eucharist.

Holywell (hol'i-wel), parliamentary borough, Flintshire, North Wales, on the estuary of the Dee, 17 miles W. Liverpool. It takes its name from the well of St. Winifred, one of the most copious springs in Britain, long a famous resort for the supernatural cure of bodily disease and infirmity. The well is covered by a small Gothic building of early date. It formerly sent up 20 tons of water a minute, but its flow has decreased. Near the town are coal and lead mines, quarries, etc. Pop. 2549.

Homage (hom'ij), in feudal law, a formal acknowledgment made by a feudal tenant to and in presence of his lord on receiving the investiture of a fief or coming to it by succession, that he was his vassal. The tenant, being ungirt and uncovered, kneeled and held up both his hands between those of the lord, who sat before him, and there professed that 'he did become his man, from that day forth, of life and limb, and earthly honor,' and then received a kiss from his lord.

Homburg (hom'burg), a town of Prussia, province of Hesse-Nassau, 9 miles N. N. W. Frankfort. It is well and regularly built, and is much frequented on account of the mineral springs and bathing establishment, to which gaming-tables were formerly attached. The waters are of two classes, those of three springs being purgative, and used for complaints of the stomach, liver, kidneys, etc.; those of the remaining two containing iron and being used as a tonic. Pop. (1905) 13,740.

Home (hōm), DANIEL DOUGLAS, spiritualist, born near Edinburgh in 1833; died in 1886. He was brought when young to the United States, and as a youth became famous for his mediumistic powers. In 1855 he removed to Europe, where his remarkable manifestations excited great attention. He was especially notable from having convinced Sir William Crookes, the famous physicist, of the truth of spiritualism.

Home, HENRY, a Scottish lawyer and author, born in 1696; died in 1782. He studied law at Edinburgh, and was called to the bar in 1724. He soon acquired reputation by a number of publications on the civil and Scottish law. In 1752 he became a judge of session, and assumed the title of Lord Kames. In addition to his legal works he published *Essays on British Antiquities; Essays on the Principles of Morality and Natural Religion*, in which he advocates the doctrine of philosophical necessity; *Introduction to the Art of Thinking;* and his best-known work, *Elements of Criticism*, in which, discarding all arbitrary rules of literary composition, he endeavors to establish a new theory on the principles of human nature. In 1776 he published the *Gentleman Farmer;* and in 1781 *Loose Thoughts on Education.*

Home, JOHN, a Scottish clergyman and dramatic poet, born at Leith in 1722; died at Edinburgh in 1808. He studied for the church, and was appointed to the parish of Athelstaneford, vacant by the death of Blair, author of the Grave. His tragedy of *Douglas* was performed at Edinburgh in 1756, and attained a wonderful popularity, which has not yet altogether disappeared. The production gave great offense to the church as a body; the author was threatened with ecclesiastical censures, and in consequence resigned his living, and ever after acted and appeared as a layman. He retired into England, obtained the protection of the Earl of Bute, and received a considerable pension. His other plays, the *Siege of Aquileia*, the *Fatal Discovery*, *Alonzo*, and *Alfred*, are absolutely forgotten, a fate which their mediocrity deserves. His *History of the Rebellion of 1745-46* also disappointed public expectation.

Home Department, that department of the executive government of Britain in which the interior affairs of the country are regulated. It is analogous to the ministry of the interior of other countries; its headquarters is the home office, and its chief is the home secretary.

Homer (hō'mėr; Greek, *Homēros*), an ancient Greek epic poet of whom nothing is known with certainty, some even doubting whether he ever existed. The most probable opinion is that he was a native of some locality on the sea-board of Asia Minor, and that he flourished between 950 and 850 B.C. The earliest mention of the name of Homer is found in Xenophanes (sixth century B. C.) The common statement that he was blind may safely be discarded. The poems that have been generally attributed to Homer are the *Iliad* and *Odyssey*. The *Batrachomyomachia*, or *Battle of the Frogs and Mice*, and certain hymns to the gods also passed under his name, though belonging to a later period. The *Iliad* in its present form consists of twenty-four books, and tells the story of the siege of Troy from the quarrel of Achilles with Agamemnon to the burial of Hector, with subordinate episodes. The *Odyssey* is also in twenty-four books, and records the adventures of Odysseus (Ulysses) on his return voyage to his home in Ithaca after the fall of Troy. Even as early as the beginning of the Christian era, certain Greek critics (the Separatists) maintained that the two poems were the work of different poets, but the general belief continued to be that there was one author for both. The entire system of Homeric criticism, however, was revolutionized in 1795 by F. A. Wolf in his *Prolegomena to Homer*. He asserted that the *Iliad* and *Odyssey* were not originally committed to writing, and were not two complete and independent poems, but originally a series of songs of different poets (Homer and others), celebrating single exploits of heroes, and first connected as wholes by Pisistratus, about 540 B.C. Some of Wolf's arguments have been proved erroneous, but since his time the old views in regard to the *Iliad* and *Odyssey* have been held by comparatively few of the ablest scholars, though what theory is now the most common is difficult to say. Among the most conservative theories is that which assigns to Homer a central or basal portion of both *Iliad* and *Odyssey*, to which additions by other poets were gradually united; but generally the *Odyssey* is regarded as of somewhat later date than the *Iliad*, and not by the poet who produced the *Iliad* in its original form.

Homer—ancient bust.

Homer, WINSLOW, painter, born at Boston, Massachusetts, in 1831. He studied lithography, then began to draw on wood for engravers, and in 1859 established himself in New York,

where he became a newspaper artist and correspondent. His war pictures were highly esteemed, especially his *Prisoners at the Front*. He died in 1910.

Home Rule, in British politics, a measure which has been very actively advocated in regard to Ireland. The leading feature of the Irish Home Rule party seems to be the establishment of a native parliament in Ireland to conduct all local and internal legislation, leaving the general political government of the empire to an imperial parliament. The movement originated in the formation of the Home Government Association at Dublin, in 1870, under the presidency of Mr. Isaac Butt. At the general election of 1874 the party succeeded in sending 60 Home Rule members to parliament for Irish constituencies. The elections of 1885 and 1886 still further strengthened the party, 86 members following the lead of Mr. Parnell (which see). The conversion of Mr. Gladstone and many members of the Liberal party to Home Rule principles added immense strength to the movement. In 1893 a Home Rule bill was passed by the Commons, but defeated by the Lords. Another bill introduced by Mr. Asquith in 1912 met with a similar fate; but was enacted into law May 25, 1914, over the veto of the House of Lords. It provides for an Irish Parliament consisting of a nominated House of Lords and a House of Commons with 164 members, a wide range of financial powers being granted to the Irish government. The outbreak of the European war (August, 1914) postponed enforcement, but Premier Lloyd George announced, in April, 1918, that the time had come to grant Home Rule, but coupled the announcement with the statement that conscription would be made applicable to Ireland. This led to opposition, and the measure was again postponed.

Home-sickness, in medicine, *Nostalgia*, a disease arising from an intense and uncontrolled feeling of grief at separation from one's home or native land.

Homestead (hōm'sted), a manufacturing town of Allegheny county, Pennsylvania, 7 miles S.E. of Pittsburgh. It has extensive steel works and other manufactures. A serious labor outbreak took place here in 1892, attracting wide attention and ending in the loss of several lives. Pop. 18,713.

Homestead Laws, laws enacted in the United States by Congress or by State legislatures with a view to securing to families the possession of a home and land. Under these laws any citizen, or person who declares an intention to become a citizen, male or female, 21 years old, may become the possessor of a homestead of 80 or 160 acres, by occupation and cultivation, to be taken from unreserved public lands. A fee of $5 or $10 is required to be paid on filing affidavit of settlement, citizenship, age, etc. The total fee is from $26 to $34, according to the district of settlement. Five years' residence and cultivation are required, but only three are demanded where 5 or 10 acres of forest trees have been cultivated. Ex-Union veterans or their heirs may obtain a patent one year after residence. Benefits are limited to one claim, except that veterans who have made one land settlement may also take a homestead claim. Under timber culture provisions homestead locators may secure another 160 acres, including timber area, by cultivating 40 acres of trees. A homestead is free from debt liability before patent issues and a locator may, on proof of settlement six months after occupancy, buy said land at preëmption price. A general land-office, forming a bureau of the Interior Department, is in charge of land administration. Each State has a surveyor-general, and each congressional district a land-office. The public lands are divided into 'hundreds,' 10 miles square; these into 'sections,' 1 mile square, and these into quarters of 160 acres and eighths of 80 acres.

Homicide (hom'i-sid), the killing of one man or human being by another. In law, homicide is of three kinds—*justifiable*, *excusable*, and *felonious*—*justifiable*, when it proceeds from unavoidable necessity, as where the proper officer inflicts capital punishment, where an officer of justice kills an offender who assaults or resists him and who cannot otherwise be captured, or where persons are killed in the dispersion of rebellious or riotous assemblies; *excusable*, when it happens from misadventure, as where a man in doing a lawful act by accident kills another, or in self-defense, as where a man kills another in defense of the life of himself, his wife, children, parent, servant, etc.; *felonious*, when it proceeds from malice, or is done in the prosecution of some unlawful act, or in a sudden passion. Self-murder also is felonious homicide. Felonious homicide comprehends murder and manslaughter.

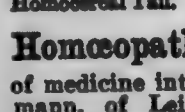
Homiletics (hom-i-let'iks), the art of preaching; that branch of practical theology which teaches the principles of adapting the discourses of the pulpit to the spiritual benefit of the hearers, and the best methods which

for instructing their hearers by their doctrines and example. Increased attention has been drawn to homiletics by Lyman Beecher of Yale.

Homily (hom'i-li), a discourse or sermon read or pronounced to an audience on some subject of religion; a discourse pronounced in the church by the minister to the congregation. The ancient homily was sometimes simply a conversation, the prelate talking to the people and interrogating them, and they in turn talking to and interrogating him. In modern use a homily differs but little from an ordinary sermon, the idea of simplicity, however, being always attached to it. The earliest existing examples of the homily are those of Origen in the third century. In the schools of Alexandria and Antioch this form of discourse was sedulously cultivated, and Clement of Alexandria, St. Dionysius, and Gregory Thaumaturgus are among the names most eminent in this department. It was in later centuries, however, and in the hands of Athanasius, Gregory of Nyssa, and Gregory of Nazianzus, Basil, Cyril of Jerusalem, and Cyril of Alexandria, and especially of Chrysostom that the homily reached its highest excellence. Augustine and Gregory the Great were among the western composers of homilies. In the Church of England, after the Reformation, two official books of homilies were issued. These were called *The First and Second Books of Homilies*, and the former, ascribed to Cranmer, appeared in 1537; the latter, said to be by Jewell, in 1563. They were originally meant to be read by those of the inferior clergy who were not qualified to compose discourses themselves.

Homing Pigeon. See *Carrier Pigeon.*

Homocercal (hō-mu-sėr'kal; Gr. *homos*, same, *kerkōs*, tail), a term applied in the case of fishes which have tails with rays diverging symmetrically from the backbone, as opposed to *heterocercal*.



Homocercal Tail.

Homœopathy (hō-mē-op'a-thi), the name of a system of medicine introduced by Samuel Hahnemann, of Leipzig (died 1843). It is founded upon the belief that drugs have the power of curing morbid conditions similar to those they have the power to excite, an old belief of Hippocrates long ago expressed in the Latin phrase *similia similibus curantur* ('like is cured by like'). In contradistinction to this system the more common method of treating diseases was termed by him *heteropathy* or *allopathy*. In practice homœopathy formerly was associated with the system of administering infinitesimal doses, though this practice has been modified within recent years and larger doses are given. The system of homœopathy in Europe, and especially in Britain, has been bitterly opposed by the older school of medicine, though the antagonism has mitigated within recent years. In the United States homœopathy met with less opposition and had a considerable development, numerous medical colleges, hospitals, etc., being established for the study and practice of this system. According to the definition adopted by the American Institute of Homœopathy, a homœopathic physician is one who adds to his knowledge of medicine a special knowledge of homœopathic therapeutics and observes the *law of similia*. All that pertains to the great field of medical learning is his, by tradition, by inheritance, by right. This explains why homœopathic physicians sometimes prescribe 'old school' drugs.

Homoiousians (hō-moi-ō'si-ans), a sect of Arians who maintained that the nature of Christ is not the same as but only similar to that of God. See *Homoousians*.

Homologous (hom-ol'o-gus), (1) in geometry, corresponding in relative position and proportion. (2) In physiology, corresponding in type of structure; thus, the human arm, the foreleg of a horse, the wing of a bird, and the swimming-paddle of a dolphin or whale, being all composed essentially of the same structural elements, are said to be homologous, though they are adapted for quite different functions. See *Analogue*.

Homoousians (hō-mō-ō'si-ans), the orthodox party in the church during the great controversy upon the nature of Christ in the fourth century, who maintained that the nature of the Father and the Son is the same, in opposition to the *Homoiousians*, who held that their natures were only similar.

Homoptera (hom-op'tėr-a), one of the sections into which the order of hemipterous insects has been

Homoptera—*Cicada Diardi*.

divided, the other section being the Heteroptera. The insects of this section have the wing-covers generally deflexed, of the

same consistence throughout, the antennæ mostly short and terminated by a bristle, and the body convex and thick. To this section belong the aphides, cicadas, lantern-flies, etc.

Homs (hōms). See *Hems*.

Honan (hō'nän'), a once populous city of China, in the province of same name, on an affluent of the Hoang-ho. The province has an area of 65,104 square miles. It is generally level, and is watered by the Hoang-ho and its affluents. The soil is fertile and carefully cultivated; the forests in the west supply timber; and mines yield tutenag or Chinese copper, cinnabar, mica, etc. Honan suffered severely from the inundation of the Hoang-ho in 1887; capital, Kai-fung. Pop. about 22,000,000.

Honawar (hō-nä-wur'), seaport and chief town of subdivision of the same name, Bombay, on an estuary into which the Gersoppa river falls. It has an important and growing coasting trade. Pop. 6929.

Hondo (hon'dō), the name given by the Japanese to the chief island in their empire. In many geographical works Nippon or Niphon is the distinctive appellation of this island, but by the Japanese themselves that name is applied to the whole country. The area of the island is 87,425 sq. miles, and the population 33,327,935. See *Japan*.

Honduras (hon-dō'ras), a republic of Central America; area, 46,400 square miles, bounded N. by the Caribbean Sea and the Gulf of Honduras, W. by Guatemala, S. W. by Salvador and the Bay of Fonseca on the Pacific, and S. E. by Nicaragua, the coast line being about 350 miles in length. Its surface is hilly, with numerous fertile valleys. Its mineral wealth is very considerable, and includes gold, silver, lead and copper, the copper deposits being very rich. The chief rivers are the Chamelicon, Ulua, and Aguan, flowing to the Caribbean Sea, and the Choluteca, an affluent of the Pacific. There are extensive forests abounding in fine timber, including mahogany and rosewood, with dye-woods, copal, rubber, etc. The cultivated productions include maize, beans, some wheat, rice, plantains and tobacco. The banana is widely cultivated, sugar-cane yields two or three crops a year, the coffee is of excellent quality and sarsaparilla and vanilla of the best quality are grown. Since 1880 the capital has been Tegucigalpa; the principal ports are Truxillo on the Caribbean Sea, and Port San Lorenzo, on the Pacific. The constitution of Honduras gives the legislative power to a congress of deputies composed of thirty-seven members. The executive authority is in the hands of the President. Reciprocity of trade with the United States was established April 30, 1892. Pop. about 600,000.

Honduras, Bay of, a wide inlet of the Caribbean Sea, having on the south Guatemala and Honduras, and on the west British Honduras and Yucatan. Along its shores are the islands of Bonaca, Ruatan, Utila, Turneff, and numerous islets and reefs called cays.

Honduras, British, or Belize, a British colony of Central America, having north and west, Yucatan; west and south, Guatemala; and east, the Bay of Honduras. Area, 7,562 sq. miles. The coast is generally low and swampy, but the land rises towards the interior, and in some parts may be called mountainous. The mountains, and the wide valleys between them, are covered with extensive forests of the finest timber, including cedars, pines, ironwood, logwood, braziletto, mahogany, etc. Sugar-cane, coffee, bananas, cocoanut, tobacco, etc., are cultivated; and the exports include mahogany, logwood, bananas, and other fruits. The climate is fairly healthy. Since 1884 the government has been administered as in a crown colony under the presidency of a governor. The capital is Belize or Balize. Honduras was transferred by Spain to England by treaty in 1670, but at different times its occupation was contested by the Spaniards till 1783, since which period it has remained quietly in the possession of Great Britain. The population is composed chiefly of negroes and Caribs from the West Indies, who were first brought to the country as slaves. Pop. 31,471, including about 400 whites.

Hone (hōn), the name given to several varieties of slaty stones employed in whetting knives, razors, or other edge-tools. They are usually pieces of hard, close-grained clay-slate, containing minute particles of quartz, with a uniform consistence. Best of all varieties is the Turkey oil-stone, and next in esteem are the Arkansas oil-stones. Others of value are the German and Scotch hones, and the Canada oil-stones.

Hone, William, an English antiquary, born in 1780; died in 1842. He began life in a law-office, and became imbued with freethinking opinions. In 1800 he abandoned the law and made ventures as a writer, bookseller and publisher, which were all failures. In 1817 he was prosecuted by government for the publication of alleged irreverent

parodies and lampoons, when he defended himself with great acuteness, and was acquitted. He subsequently had a large sum subscribed for him as a champion of the freedom of the press. He gradually abandoned freethought and the writing of satires for religion and antiquarianism. His chief publications are the *Every-day Book* (1826), *Table-book* (1827-28), and *Year-book* (1829), perfect mines of antiquarian lore.

Honey (hun'i), a vegetable product with saccharine properties, collected by bees from the blossoms of flowers, and deposited in the cells of their combs. The best is clear and transparent, and solidifies when kept for some time into a granular, white mass. Some varieties of it are dark yellow or brownish in color. Spring honey is more esteemed than summer honey; and the latter more than that of autumn. *Virgin* honey is taken from hives in which the bees have never swarmed, and it is of a white color. *Yellow* honey is extracted from all sorts of combs. The flavor of honey largely depends on the plants from which it is collected. Honey is obtained in large quantities in many countries, partly from wild bees, but chiefly from those kept in hives. In addition to its ordinary domestic uses, it is employed medicinally as a promoter of expectoration, to sweeten certain medicines, to make a gargle with vinegar, etc. The ancients used it as we do sugar, and made of it and wine a mixture which they very much liked. They also used it in making mead, a fermented liquor made of honey and water. See *Honey-comb*.

Honey-ant, an ant (*Myrmecocystus mexicanus*) inhabiting Mexico, and living in communities in subterranean galleries. In summer a certain number of these insects secrete a kind of honey in their abdomens which become so distended as to appear like small pellucid grapes. When food is scarce these ants feed the others from their store of honey. They are also dug up and eaten by the inhabitants of the country.

Honey-badger. See *Ratel*.

Honey Bear, a name of the kinkajou.

Honey-buzzard. See *Buzzard*.

Honey-comb, a waxen cellular structure framed by bees in which to deposit their honey and eggs. The wax is secreted by the insect in the form of small and thin oval scales in the folds of the abdomen. The comb is composed of a number of cells, most of them exactly hexagonal, and arranged in two layers placed end to end, the openings of the layers being in opposite directions. The comb is placed vertically, the cells being therefore horizontal. The sides of the cells are very thin, and yet the whole structure is of considerable strength. Some cells are destined for the exclusive reception of honey; others for the reception of larvæ.

Honey-dew, a liquid saccharine substance found on the leaves of trees and other plants in small drops like dew. There are two kinds; one secreted from the plants, and the other deposited by aphides. Different kinds of manna are the dried honey-dew or saccharine exudations of certain plants. See *Manna*.

Honey-eater, the name given to a number of insessorial birds forming the family of Meliphagidæ, of the tribe Tenuirostres. They form a

Wattled Honey-eater (*Anthochæra mellivora*).

numerous group, feeding principally on honey and the nectar of flowers. They are natives of Australia and the adjacent islands. They have long curved sharp bills, with tongues terminating in a pencil of delicate filaments, to enable them the better to extract the juices of flowers.

Honey-guide, a name given to the cuckoos of the genus *Indicator*, which by their motions and cries conduct persons to the nests of wild honey-bees. They are natives of South Africa.

Honey-locust, Sweet Locust, or Black Locust (*Gleditschia triacanthos*), a forest tree belonging to the United States, natural order Leguminosæ. The leaves are pinnated, divided into numerous small leaflets, and the foliage has a light and elegant appearance; the flowers are greenish, and are succeeded by long, often twisted pods, containing large brown

seeds, enveloped in a sweet pulp. This tree is especially remarkable for its formidable thorns, on which account it has been recommended for hedges. The *G. monosperma*, a tree resembling the last in general appearance, grows in swamps in Illinois and southwestward. The wood is inferior in quality.

Honey-stone. See *Mellite.*

Honey-suckers. Same as *Honey-eaters.*

Honeysuckle, or WOODBINE, genus *Lonicēra* of Linnæus, natural order Caprifoliaceæ. *L. periclymēnum*, a twining shrub, with distinct leaves and red berries, is indigenous in Great Britain; but two others have been naturalized, *L. caprifolium*, distinguished by its upper leaves being united in a cup; and *L. xylosteum*, with small, yellowish, scentless flowers, and scarlet berries. *L. sempervirens* (trumpet-honeysuckle) is also cultivated in Britain on account of the beauty of its flowers. The honeysuckle family is represented in North America by nine different species. *Australian honeysuckle* is a name given to *Banksia australis* and other species of the Protea family, from their flowers being filled with a sweet liquid.

Honfleur (on-fleur), a seaport of France, department of Calvados, on the estuary of the Seine. It was a poorly-built place, but has lately been much improved. The rise of Havre has injured its commerce, but it still has a trade in agricultural and dairy produce, some manufactures in connection with shipping, fisheries, etc. On the hill above the town is the chapel of Nôtre Dame de Grace, much frequented by sailors, and filled with their votive offerings. Honfleur was long in possession of the English, and makes a considerable figure in the history of their French wars. Pop. 8853.

Hong-Kong (hong-kong'), an island off the S. E. coast of China, belonging to the British, at the mouth of the estuary that leads to Canton, from which it is distant 90 miles. It is about 10 miles in extreme length, and 7½ miles in extreme breadth, separated from the mainland by a narrow strait, and with Cowloon on the mainland forms a crown colony, area 32 sq. miles. The island consists almost entirely of barren rocks, which rise to heights of 1000 to 2000 feet, and is almost destitute of vegetation. Good water, however, is abundant. On the north side of the island, on a splendid harbor, is Victoria, the chief town of the island and center of its commerce. It is well laid out with handsome streets, and has a cathedral, a bishop's palace, a government house, courthouse, etc., while handsome residences of the merchants are scattered about the town and its suburbs. Hong-Kong is a great entrepôt for the foreign commerce of China, and is a free port without customs' dues. It is also a station of the British fleet. The revenue of the government is derived from the land rents, licenses to sell opium, spirits, etc., taxes, postages, fines, fees of office, etc. The prosperity of the colony is chiefly owing to the presence of large numbers of Chinese, engaged in trade or in working the building-stone, which is one of the principal products of the island. The foreign commerce is mainly carried on with Great Britain. The currency consists chiefly in dollars coined in England, value about 4*s.* 2*d.* each. Hong-Kong was ceded to Britain by the Treaty of Nan-King in 1842. The population in 1912 was 456,739, of which number over 400,000 were Chinese.

Honiton (hon'i-tun), a town of England, in Devonshire, on the Otter, long celebrated for the manufacture of a special variety of lace. Pop. 3271.

Honolulu (hō-nō-lō'lō), a city, the capital and principal port of the Hawaiian Islands, on the south side of the Island of Oahu. The city is well laid out, with fine public squares, clean streets, and tropical gardens, the climate being pleasant and healthful. It contains extensive and handsome government buildings, the palace of the former kings, museum, theater, library, churches, etc., and has street railways and electric lights. Newspapers and magazines are published in the Hawaiian, Japanese, Chinese, and several European languages. At the wharves are landing facilities for the largest vessels, and there are steamship lines to various American and foreign ports. There are foundries, shipyards, and manufacturers of iron, carriages, ice, etc. Pop. (1914) 60,000.

Honorius (ho-no'ri-us), FLAVIUS, son of Theodosius the Great, born 384 A.D.; died 423. After the division of the empire, A.D. 395, Honorius received the western half, but, on account of his youth, Stilicho was appointed his guardian. The principal events of his reign are the adoption of rigorous measures against paganism in 399; the invasion by Alaric in 400-403; another irruption of barbarians under Rhadagaisus, 405-406. Both invasions were repelled by Stilicho, who was assassinated at Ravenna in 408. Alaric marched on Rome and plundered it in

409, while Honorius shut himself up in Ravenna. Some of the finest provinces of the empire, Spain, Gaul, and Pannonia, were lost in this reign.

Honor (on'ur), in law, is a seignory consisting of several manors held under one baron or lord-paramount.

Honor, Maids of, ladies in the service of an European queen who attend their mistress when she appears in public. In England they are eight in number.

Honorable (on'ur-a-bl), Right Honorable and Most Honorable, titles given in the United Kingdom to peers, their families, and certain public functionaries. (See *Address, Forms of.*) In America the governors of States, judges, members of Congress, and others holding offices of dignity and trust, are styled honorable.

Honors of War, are stipulated terms granted to a garrison surrendering, in consideration of a brave defence, etc. Sometimes the vanquished are allowed to march out with their arms, drums beating and colors flying; or they may be permitted to deposit their arms and stores and return to their own country on parole.

Hoobly (hö'bli), or Hubli, a town of India in Dhárwár district, Bombay Presidency, a great center of the cotton trade. Pop. 60,214.

Hooch, or Hoogh (hōh), Pieter de, one of the best Dutch painters in genre, born in 1630; died about 1681. He was peculiarly successful in depicting scenes, illuminated by sunlight, of Dutch domestic life.

Hood, John Bell, general, born in Bath Co., Kentucky, in 1831; died in 1879. He graduated at West Point in 1853, joined the Confederate army in the Civil war, commanded a division of Lee's army at Antietam and at Gettysburg, and lost a leg at Chickamauga. Commissioned lieutenant-general, he succeeded Johnston in command of the army opposing Sherman in 1864. He was defeated by Sherman in two battles, was forced to abandon Atlanta, and afterwards invaded Tennessee.

Hood, Mount, is the northernmost peak in Oregon in the Cascade Range, and can be clearly seen from Portland. The glaciers, such as the Elliot, the crevasses, and moraines of Mt. Hood have yet to be explored. It has a height of 11,225 ft. See *Cascade Range.*

Hood, Robin, a celebrated outlaw who, according to the popular account, with his followers, inhabited Sherwood Forest, in Nottinghamshire, and also the woodlands of Barnsdale in the adjoining West Riding. They supported themselves by levying toll on the wealthy, and more especially on ecclesiastics, and by hunting the deer of the forest. The famous members of his band were his lieutenant, Little John; his chaplain, Friar Tuck; William Scadlock, George-a-Greene, Much, the miller's son, and Maid Marian. It is stated that he was born in 1160. His death is said to have occurred in 1247, in consequence of the treachery of the prioress of Kirklees, who opened an artery by which he bled to death. His skill with the long-bow and quarter-staff was celebrated in tradition. What basis of fact there is for the story of Robin Hood is doubtful. Grimm maintained that he was one with the Teutonic god Woden. Other theories suppose him to have been a rebel yeoman in Lancaster's rebellion under Edward II; a Saxon chief who defied the Normans; and a fugitive follower of Sir Simon de Montfort after the battle of Evesham.

Hood, Samuel, Viscount, a British admiral, born 1724; died 1816. He joined the navy as a midshipman in 1740, and attained the rank of post-captain in 1759. Having become rear-admiral, he preserved the island of St. Christopher's from being taken by De Grasse, assisted in the defeat of De Grasse by Rodney in 1782, and was rewarded with the title of Baron Hood of Catherington in the Irish peerage. In 1793 he commanded against the French in the Mediterranean, and captured Toulon and Corsica. In 1796 he was made an English peer, with the title of Viscount Hood.—Alexander, Viscount Bridport, brother of the preceding, was also an admiral. He commanded under Lord Howe in the Channel fleet in 1794;

Viscount Hood.

defeated the French off L'Orient, 1795; was created Viscount Bridport, 1801; died 1814.—Sir Samuel, cousin of the above, born 1762; died 1815, was present at the battle of the Nile, 1798; captured Tobago and the Dutch settlements in Guiana, 1803; and defeated the French squadron off Rochefort in 1806.

Hood, Thomas, an English poet and humorist, of Scotch extraction, born at London in 1798; died in 1845. During a residence at Dundee, and while only fifteen or sixteen years of age, he contributed articles to a local paper and magazine. In 1821 he became sub-editor of the *London Magazine*, and in 1826 appeared his *Whims and Oddities*, which was followed by *National Tales* and a volume of serious poetry. From 1829 to 1837 he conducted a *Comic Annual*. At the same time his pen was employed on other subjects, and he published *The Epping Hunt*, a comic poem, ridiculing Cockney sportsmen; *Eugene Aram's Dream*, inserted in the *Gem*, of which he was for a short time editor; and *Tylney Hall*, a novel. In 1837, on the termination of the *Comic Annual*, he commenced a monthly periodical entitled *Hood's Own*, which consisted chiefly of selections from the former work. His health now began to fail, and with a view to its recovery he paid a visit to the Continent. While there in 1839 he published his *Up the Rhine*, which, based on the lines of Humphrey Clinker, was very popular. Shortly after his return he undertook the editorship of the *New Monthly Magazine*, and continued it till 1843. His principal contributions to it he published separately, under the title of *Whimsicalities*. His last periodical, entitled *Hood's Magazine*, was commenced in 1844; but his health shortly afterwards completely broke down, and his death occurred in the following year. It was during his last illness that he contributed to *Punch*, *The Song of a Shirt*, *The Bridge of Sighs*, and *The Lay of a Laborer*. Hood is unrivaled as a punster, and he possesses a singular power of combining the humorous with the pathetic. He had the satisfaction of knowing that the pension of £100 conferred upon him during his last illness by Sir Robert Peel was to be transferred to his wife.

Hood, Tom, son of the great humorist, and a miscellaneous writer, born in 1835; died in 1874. He studied at Oxford, and during his residence there he wrote *Pen and Pencil Pictures*. In 1861 appeared his *Daughters of King Daker, and other Poems*. In 1865 he became editor of *Fun*, which became very popular under his management. His talents, although similar to those of his father, were less brilliant.

Hooded Crow. See *Crow*.

Hooded Seal (*Cystophora cristata*), a species of seal, the male of which possesses a movable inflatable muscular bag, stretching from the muzzle to about five inches behind the eyes. The prevailing color is bluish black—the head and limbs being uniformly black. Its usual range extends in America southwards to Newfoundland, and in Europe to Southern Norway.

Hooded Snake. See *Cobra de Capello*.

Hoofs, the horny tissues which constitute the external part of the feet of certain animals, mostly herbivorous. They may be regarded as homologues of the toe-nails of other animals. They are composed of epithelium cells, agglutinated and dried, and of intercellular substance and cell contents. Chemically they consist of keratin.

Hooghly River. See *Hugli*.

Hook, Theodore Edward, novelist and journalist, born at London in 1788; died in 1841; was the son of James Hook, a musical composer. After leaving Harrow he employed himself in composing the farce of *The Soldier's Return*, instead of reading for Oxford. For some years Hook led a life of gaiety in London, and became notorious for practical jokes and similar escapades. In 1812 he was appointed accountant-general and treasurer of the Island of Mauritius; but, owing to his gross carelessness, a large deficiency in the military chest was discovered, and in 1818 he was sent home under arrest, but no proceedings were taken against him. From 1820 to 1841 he was editor of the *John Bull*, and at intervals from 1824 to 1828 he published his *Sayings and Doings*, while in 1836 he became editor of the *New Monthly Magazine*. His other principal works are *Life of Sir David Baird*, and a series of novels, among which may be mentioned *Love and Pride*, *Jack Brag*, *Gilbert Gurney*, *Gurney Married*, *Precepts and Practice*, and *Fathers and Sons*.

Hook, Walter Farquhar, Dean of Chichester, born at London in 1798; died in 1875. In 1821 he graduated at Christ Church, Oxford, was appointed vicar of Leeds in 1837, and promoted to the deanery of Chichester in 1859. He wrote an *Ecclesiastical Biography*, a *Church Dictionary*, *Lives of the Archbishops of Canterbury*, etc.

Hookah. See *Pipe* (*Tobacco*).

Hooke, NATHANIEL, an English historian, born about 1690; died 1763. He was a friend of Pope and other literary men. His best-known work is his *Roman History, from the Earliest Period to the Accession of Augustus.*

Hooke, ROBERT, an English mathematician and natural philosopher, born 1635; died 1703. In 1658-59 he invented the balance spring of watches, an honor otherwise ascribed to Huyghens. He partially anticipated the Newtonian theory of gravitation and the undulatory theory of light.

Hooker (huk'ẽr), JOSEPH, general, was born at Hadley, Massachusetts, in 1815. Graduating at West Point in 1837, he served in the Florida and Mexican wars with conspicuous gallantry. At the outbreak of the Civil war he was made brigadier-general of volunteers. He distinguished himself in the several engagements in the Peninsula in 1864, particularly at Malvern Hill, and became known as 'fighting Joe Hooker.' He took part in the subsequent battles of 1862, being wounded at Antietam, and subsequently was commissioned brigadier-general in the regular army, already holding the rank of major-general of volunteers. He commanded a division at Fredericksburg, was given command of the army of the Potomac in January, 1863, and was defeated by Lee and Jackson at Chancellorsville in May. He took part in the battles near Chattanooga, and in the battle of Lookout Mountain he was commander. Later he commanded the army of the Cumberland near Atlanta, Georgia. In 1864 he had charge of the northern department, of the department of the east in 1865, and in 1866 that of the lakes. He died in Garden City, Long Island, in 1879.

Hooker, SIR JOSEPH DALTON, a British botanist, born in 1817, son of Sir W. J. Hooker. In 1839 he joined the antarctic expedition of the *Erebus* and *Terror* under Sir J. C. Ross, publishing on his return the *Botany of the Antarctic Voyage.* In 1847-51 he traveled in the Himalayas, and his *Himalayan Journals* embody the results of the journey. He and George Bentham (which see) wrote the great work *Genera Plantarum*, published 1862-1883.

Hooker, RICHARD, a celebrated English divine, born in 1553; died in 1600. In 1579 he was appointed deputy professor of Hebrew; took orders in 1581, and was made preacher at Paul's Cross. His *Ecclesiastical Polity*, published at various dates, and written in defense of the Church of England, is remarkable for learning and style.

Hooker, THOMAS, an English-American theologian, born in Markfield, Leicestershire, England, in 1586; died in Hartford, Conn., in 1647. He settled in Newtowne (now Cambridge), Mass., in 1633, but being discontented with conditions led his congregation to Connecticut and founded Hartford in 1636. He caused the adoption of the *Fundamental Orders of Connecticut*, and in 1643 was one of the organizers of the United Colonies of New England. He published a number of sermons and various theological treatises.

Hookworm, a small, worm-like animal, the cause of a serious parasitic disease. The disease was first traced to this worm (a minute form, less than an inch in length) in Italy in 1843. Its action in exhausting the blood was not discovered until 1879, and not until 1902 was the existence of an American variety of the animal demonstrated by Dr. Charles W. Stiles, of the Marine Hospital Service, who indicated the character of the disease by calling it the 'germ of laziness.' The poorer classes of the South had long manifested a peculiar lassitude, with anæmic pallor. Dr. Stiles traced the worm into the body from the soil, finding that it made its way through the skin of the feet into the circulation, reaching the lungs and from them the respiratory passages and the digestive tract. Fastening itself to the walls of the bowels, it sucks the blood of the victim. There may be several thousand of these worms in one person, causing considerable loss of blood by sucking and by making minute holes through which the blood oozes into the intestinal tract. It is believed that the hookworm was conveyed to America from Africa by negroes brought in slave ships. It does not seriously affect the negroes, but has been affecting the whites for more than a century, producing a condition unfitting them for energetic labor. Dr. H. F. Harris was the first to recognize the eggs of the hookworm and realize the danger of the disease in this country. In 1902 Dr. Stiles was sent a bottle of the parasites from the South, and found in it a different species from that of Europe. Out of 130 cotton mill operatives he found more than 12 per cent. with the disease. In the sandy districts more than 70 per cent. were infected, and in some localities as many as 90 per cent. The disease is confined in this country to the South, rarely appearing north of the Potomac. Its wide prevalence is attributed to the unsanitary habit of blacks and poor whites alike in distrib-

uting their excrement over the soil and in going barefoot, giving the worms in the excrement an opportunity to fasten in the skin of the feet. Fortunately the disease is easily cured by the use of thymol, which kills the worms or forces them to loosen their hold, followed by purgatives, which removes them from the body. By the adoption of suitable sanitary habits this serious affection may be eradicated. John D. Rockefeller, in 1909, contributed $1,000,000 to be used in fighting the disease, and now that its cause and the method of dealing with it are so well known its ravages may be overcome.

Hoole (hōl), JOHN, dramatist and translator, born at London in 1727; died in 1803. In 1763 he published a translation of Tasso's *Jerusalem Delivered*, and of six dramas of Metastasio in 1767. His tragedies of *Cyrus*, *Timanthes* and *Cleone* were unsuccessful. In 1773-83 he published separate volumes of his translation of *Orlando Furioso*. In 1792 he translated Tasso's *Rinaldo*, and ended his literary labors with a more complete collection of dramas from Metastasio.

Hoop-ash (*Celtis crassifolia*), an American tree of the order Urticaceæ, found in the forests of Ohio and in the western States. It is a fine tree, attains a height of 80 feet, and is employed for charcoal. Its fruit is round, and in size nearly equal to a pea. See *Hackberry* and *Nettle-tree*.

Hooper (hup'ėr), JOHN, an English reformer, born in 1495. Having studied at Oxford, he joined the Cistercian order, but by the year 1539 he had adopted the Reformed opinions, and withdrew to the continent on the imposition of new articles of faith by Henry VIII, and lived at Zurich. In 1547 he returned to England, and took an active share in the Edwardine Reformation. In 1550 he was nominated Bishop of Gloucester, but declined consecration until certain vestments and ceremonies were dispensed with in his case. On the accession of Queen Mary, in 1553, Hooper was deprived and imprisoned, and in 1555, was burned at Gloucester, near his own cathedral. His works consist chiefly of a *Godly Confession and Protestation of the Christian Faith*, *Lectures on the Creed*, *Sermons on the Book of Jonah*, *Annotations on the Thirteenth Chapter of the Romans*, and expositions of several psalms.

Hooping-cough, or WHOOPING-COUGH, a disease known by a rapid series of coughs ending in a long-drawn inspiration, during which a shrill whistling sound, the *hoop*, is produced. Two or three such fits of coughing follow one another, until some phlegm is expelled, and vomiting may occur. During a severe spasm the face becomes swollen and purplish, as if suffocation were threatened. It is evidently due to a poison acting as an irritant on the pneumogastric nerve. It is contagious, and most commonly attacks children, and generally only once in their lives. The hooping-cough usually comes on with a running nose, difficulty of breathing, and slight fever, which are succeeded by a hoarseness, cough and difficulty of expectoration.

Hoopoe (hu'pō; *Upupa*), a bird forming the type of a family generally classed with the bee-eaters or the honey-eaters, but also with the horn-

Hoopoe (*Upupa epops*).

bills. The European hoopoe (*U. epops*) is about 12 inches long; it has a fine crest of pale cinnamon-red feathers, tipped with black; upper surface on the whole ashy-brown; wings black, the coverts having white bars; throat and breast pale fawn; abdomen white, with black streaks and dashes. It has a very wide range, from Burmah to the British Islands and Africa. It is a ground-feeder, preying chiefly on insects, and seems to delight in filth; it nests in cavities of trees or walls, and its eggs vary from four to seven. The hoopoe utters a loud double or treble *hoop*, whence its name.

Hoorn (hōrn), a seaport of Holland, on a small bay of the Zuider-Zee, 20 miles N. N. E. of Amsterdam. The trade is extensive, more especially in cheese. Pop. 10,647.

Hoosac Tunnel, a railway tunnel in the western part of Massachusetts, on the railway

from Boston to Troy, N. Y. It pierces the Hoosac Mountain, the summit range extending southward through Massachusetts from the Green Mountains of Vermont. It is 4¾ miles long, and has a double line of rails.

Hoosick Falls, a village of Rensselaer county, New York, 25 miles N. E. of Troy. It has manufactures of reapers, mowers, woolen goods, iron and paper mill machinery. Pop. 5532.

Hoover, Herbert C., mining engineer and government officer, was born at West Branch, Iowa, in 1874. He engaged in mining operations in California, Australia, and China, where in 1899 he became chief engineer of the Chinese Imperial Board of Mining. Going to England he was occupied with mining and other enterprises and on the outbreak of the European war was made chairman of the American Relief Commission in London and later of the American Commission for Belgian Relief. On the United States entering the war he returned to accept the office of Food Controller with autocratic powers over the prices and distribution of food. See *United States.*

Hop (*Humulus lupulus*), a plant of the nat. order Cannabinaceæ (hemp family), a native of Europe, and perhaps of the United States, where it occurs wild. The root is perennial, giving out several herbaceous, rough, twining stems, with large lobed leaves; the fertile flowers are green; the fruit is a catkin, and the plant is cultivated for the sake of the catkins, which are employed to communicate to beer its bitter flavor. The young shoots are sometimes boiled and eaten like asparagus; the fibers of the old stems make good cords. The cultivation of the hop is more carefully attended to in England than in any other country, Kent being the chief county in which it is grown, but the plant is also extensively reared in other parts of Europe, as also in North America, Australia, New Zealand, etc. The use of the hop catkins depends upon a peculiar bitter substance which they contain, called *lupulin*, which is a yellow powder, containing a bitter principle and a volatile oil. The lupulin constitutes from 10 to 12 per cent by weight of the catkin, and the bitter principle forms 8 to 12 per cent of the lupulin. Having tonic, stomachic and narcotic properties, hops are often used medicinally. Pillows stuffed with hops are used to induce sleep.

Hop-Clover (*Trifolium procumbens*), a plant of the order Leguminosæ, distinguished from other species of clover by its yellow flowers.

Hope (hōp), Anthony. See *Hawkins.*

Hop-flea (*Phyllotreta sanguinea*), a coleopterous insect of the same genus with the turnip-fly, and which devastates hop plantations. It feeds upon the young shoots.

Hopi (hō'pi), or **Moki,** a tribe of N. American Indians of Shoshonean stock; first mentioned in the account of the expedition of Coronado (1540). They were then town-building Indians of Arizona. They fought unsuccessfully against the Spaniards in 1540, 1542 and 1598, but were victorious in 1680. There are still about 2000 of them in N. E. Arizona. They build houses of stone, and are engaged in 'dry-farming,' wood-carving, basket-making, and pottery. Among their elaborate ceremonies is the famous 'snake dance,' with live rattlesnakes in the mouth.

Hopkins, Johns, philanthropist, born in Anne Arundel county, Maryland, in 1795. Died in 1873. He gave property worth over $7,000,000 to found a free hospital and Johns Hopkins University in Baltimore.

Hopkins, Samuel, American theologian, was born at Waterbury, Conn., 1721; died 1803; was noted particularly as the founder of 'Hopkinsian divinity,' a modification of Calvinism, and a fuller development of the theology of Jonathan Edwards, which he expounded in his *System of Doctrines* (1793). Hopkins was one of the ablest of American theologians and was probably the first of the Congregational ministers to oppose slavery.

Hopkins, Stephen, statesman, born in Providence, Rhode Island, in 1707; died in 1785. He became chief justice of the Superior Court of Rhode Island in 1751, and was elected governor in 1756. He was a member of the Continental Congress and a signer of the Declaration of Independence.

Hopkinson (hop'kin-sun), Francis, a signer of the Declaration of Independence, was born in Philadelphia in 1737. He was admitted to the bar in 1761. In 1776 he was a delegate to the Continental Congress. During the war for independence his patriotic writings powerfully influenced public sentiment. His humorous *Battle of the Kegs* still holds a place in literature. He died in 1791.

Hopkinsville, county seat of Christian county, Kentucky, 73 miles N. of Nashville; has an extensive trade in tobacco, and various manu-

factures. Here are McLean College and Bethel Female College. Pop. 10,000.

Hoquiam, a city in Chehalis County, Washington, 18 miles W. of Montesano. It is in a forest region and has many large lumber mills. Ships lumber, fish and furs. Pop. 3171.

Horæ (hō'rē), in classical mythology, the goddesses of the seasons and the order of nature. Their number was indefinite; in Athens two only were worshiped. They are represented as blooming maidens carrying the different products of the seasons.

Horæ Canonicæ, or simply **Horæ,** in the Roman Catholic Church the canonical or appointed hours at which certain hymns and devotions, themselves termed *Horæ* or *Hours*, are performed in monasteries. See *Canonical Hours*.

Horapollo (ho-rā-pol'o), the alleged author of a work in Egyptian hieroglyphics pretended to have been translated from the Egyptian into Greek. By many authorities the book is supposed to have been written about the fifth century and translated as late as the fifteenth.

Horatii (ho-rā'shē-ī), three Roman brothers, who, according to tradition, in the reign of Tullus Hostilius engaged three Alban brothers (the Curiatii), in order to decide the supremacy between Rome and Alba. Victory went to Rome, and the sole surviving Horatius was triumphantly conducted back to the city. But his sister had been betrothed to one of the Curiatii, and her demonstrative grief so enraged Horatius that he stabbed her. For this he was condemned to death, but his father and the people obtained his pardon.

Horatius Cocles (hō-rā'shē-us kō'klēz), a hero of ancient Rome. The Tarquins having, after their banishment, sought refuge with the Etrurian king Porsenna, the latter advanced against Rome (B.C. 507) to restore them. According to tradition Horatius Cocles, along with two companions, held the Sublician bridge against the enemy, while the Romans broke it down behind them. When this was nearly finished he sent back his two companions, and as the bridge fell he plunged into the Tiber with his armor and safely reached the opposite bank.

Horatius Flaccus, QUINTUS, commonly known as HORACE, the greatest of Latin lyric poets, was born near Venusia, in Southern Italy, B.C. 65. His father was a freedman, a collector of taxes, and had purchased the farm at which his son was born. When Horace was about twelve years of age his father removed with him to Rome, where he received an excellent education. At the age of eighteen he went to Athens to complete his studies. After the assassination of Julius Cæsar Brutus came to Athens, and Horace, along with other Romans youths, joined the army. He was appointed to a military tribuneship, was present at Philippi, and on the defeat of Brutus saved himself by flight. On the proclamation of an amnesty to the vanquished Horace returned to Italy, but found his father dead, his paternal estate confiscated, and himself reduced to poverty. He was, however, enabled to purchase a clerkship in the quæstor's office, which enabled him to subsist frugally and to cultivate his poetical talent. His poems procured him the friendship of Virgil and Varius, and to them he was indebted for his first acquaintance with Mæcenas, who was the friend and confident of Augustus Cæsar, and who expended his wealth for the encouragement of literature and the arts. Mæcenas received Horace among his intimate friends, and, after some years, presented him with a small estate or farm in the Sabine country about 15 miles from Tibur (Tivoli), which was sufficient to maintain him in ease and comfort during the rest of his life. He had also a cottage at Tibur, and at Rome or one or other of these country residences the latter part of his life was spent. Although he was ultimately introduced to Augustus he never sought favors from him, and he is said to have declined an offer of the management of his private correspondence. He died in B.C. 8, the same year as his friend and patron Mæcenas. His works consist of four books of odes; a book of epodes or short poems, two books of satires; and two books of epistles, one of which is often cited as a separate work, under the title of *Ars Poetica*. The lyrics of Horace are largely based on Greek models, but the exquisite beauty of his language is all his own. It is, however, in his satires and epistles that he shows the greatest power and originality, wit and humor, gravity and gaiety, shrewdness and common sense, tender sentiment, and at times melancholy. His writings have been often translated, and into many languages. In English Pope and Swift have given free imitations of various parts of his writings. The poetical translation of Francis is well known, but is inferior to that of Sir Theodore Martin.

Hörde (hœr'dē), a town of the Prussian province of Westphalia on the Emscher, center of the iron manufac-

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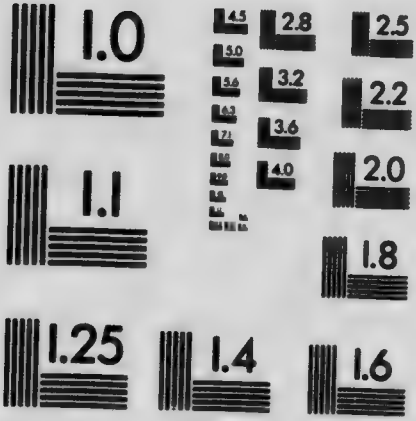

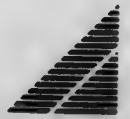

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ture, and having large coal-mines. Pop. (1910) 32,791.

Horde'olum See *Stye.*

Hor'deum See *Barley.*

Horeb (hō'reb; Arabic, *Jebel Mûsa*, Mountain of Moses), a mountain belonging to the same ridge as Mount Sinai, where is still pointed out the rock from which water issued at the blow of Moses.

Horehound (hōr-hound; *Marrubium vulgāre*), a labiate plant, with whitish, downy leaves and stem; flowers, small, nearly white, in crowded whorls, possessing an aromatic smell and bitter flavor. It is a popular remedy for coughs and colds, usually as an infusion. It is a native of Europe. Black horehound (*Ballōta nigra*), also a labiate plant, is a malodorous and unattractive weed. Horehound is domesticated in the United States.

Horehound (*M. vulgāre*).

Horgen (hōr'gen), a town of Switzerland, on the lake of Zürich, with some manufactures and a harbor with a considerable trade. Pop. (1914.

Horizon (ho-rī'zon), in ordinary speech the line where earth and sky seem to meet, or the circle which bounds that part of the earth's surface visible to a spectator from a given point. This is termed the *sensible*, *visible* or *apparent horizon*, as distinguished from the *rational* or *celestial horizon*, an imaginary great circle, parallel to the sensible horizon, whose plane passes through the earth's center, whose poles are the zenith and the nadir, and which divides the sphere into two equal hemispheres. In observations with the sextant at sea, when the real horizon is invisible a small basin containing mercury may serve as an *artificial horizon*. The observation that is then made is the angle between the sun or star and the image of the sun or star in the basin of mercury, and it is easily seen that half this angle is the altitude of the object above the real horizon. In geology, the term is applied to any well-marked formation which suffices as a starting-point from which to study the rest.

Horizon, Dip of. See *Dip.*

Horizontal Parallax. See *Parallax.*

Horn (hōrn), a general term applied to all hard and pointed appendages of the head, as in deer, cattle, etc., but as a term denoting a particular kind of substance nothing should be called horn which is not derived from the epidermis or outer layer of the integument, whether on the trunk, hoofs, or head. Horn is a tough, flexible, semitransparent substance, most liberally developed in the horns of bovine animals, but also found in connection with the 'shell' of the tortoise, the nails, claws and hoofs of animals, the beaks of bird and turtle, etc. Horn is softened very completely by heat, so as to become readily flexible, and to adhere to other pieces similarly softened. True horn consists principally of an albuminoid principle, *keratin*, with a small portion of gelatine and a little phosphate of lime. In some species of animals the males only have horns, as for instance the stag. In cattle both male and female have horns, though there are also hornless cattle. Horns differ widely in the case of different animals. Thus the horns of deer consist of bone, and are deciduous; those of the giraffe are independent bones, with a covering of hairy skin; those of oxen, sheep, and antelopes consist of a bony core covered by a horny sheath. The horns of the rhinoceros alone consist exclusively of horny matter. The horns of oxen, sheep, goats and antelopes are never shed, except in the case of the prong-horned antelope. The number never normally exceeds four, and in the case of deer the horns are branched.

The various kinds of horns are employed for many purposes. The principal used in the arts are those of the ox, buffalo, sheep and goat. Deer horns are almost exclusively employed for the handles of knives and of sticks and umbrellas. Those which furnish true horn can be softened by heat (usually in boiling water), cut into sheets of various thickness, which sheets may be soldered or welded together at the edges so as to form plates of large dimensions, and polished and dyed so as to imitate the much more expensive tortoise shell. The clippings of horn may be welded together in the same manner, and made into snuff-boxes, powder horns, handles for umbrellas, knives, forks, etc. As horn has the valuable property of taking on and retaining a sharp impression from a die, many highly ornamental articles may be turned out. Combs for the hair are made from the flattened sheets, and out of the solid parts of buffalo horns beautiful carvings are made.

Horn, a musical instrument, originally formed, as the name de-

notes, from the horn of an animal. The name includes a large family of wind-instruments, many of which have fallen into disuse. The French horn, or simply *the horn*, consists of a metallic tube of about 10 feet in length, very narrow at top, bent into rings, and gradually widening towards the end whence the sound issues, called the *bell*. It is blown through a cup-shaped mouthpiece of brass or silver, and the sounds are regulated by the player's lips, the pressure of his breath, and by the insertion of the hand in the bell of the instrument. As a simple tube, unprovided with holes, the horn yields only the generating note, and of course would be confined to one key; but by means of *crooks* the tube can be lengthened, and transposed into any key. By inserting the hand into the bell, which flattens a note, the intermediate notes are produced. The compass of the instrument is three octaves. Music for the horn is always written in the key of C, an octave higher than it is played, with the key of the composition marked at the beginning of each movement: thus 'corni (or horns) in D' directs the performer which crook he must use to play the notes in the key indicated. The bugle, cornet-a-piston and saxhorn are allied instruments.

Horn, Cape. See *Cape Horn*.

Horn, Hoorne, or Hornes, Philip, Count van, a Flemish soldier and statesman, born 1518. He was the son of Joseph de Montmorency-Nivelle, and of Anne of Egmont, and stepson of John, count van Horn, who constituted him and his brother his heirs on the condition of assuming his name. Philip gradually rose to be governor of Gueldres and Zütphen, admiral of the fleet, and councilor of state. He fought at St. Quentin in 1557, and at Gravelines in 1558, and in 1559 accompanied Philip to Spain. On his return he joined the Prince of Orange and Egmont in resistance to Philip. On the arrival of Alva at Brussels he was arrested in September, 1567, on a charge of high treason, and he and Egmont were beheaded in June, 1568.

Hornbeam (hôrn'bēm; *Carpinus Betŭlus*, nat. order Cupuliferæ), a small bushy tree common in Britain, and often used in hedges, as it stands cutting and in age becomes very stiff. The wood is white, tough, and hard, and is used in turnery, for cogs of wheels, etc. The inner bark yields a yellow dye. The American hornbeam (*Carpinus americāna*) is a small tree sparingly diffused over the whole of the United States. The wood is fine grained, tenacious, and very compact.

Hornbills (hôrn'bils), a remarkable group of birds (*Bucerotidæ*), confined to Southern Asia and Africa, akin to the kingfishers and the toucans, remarkable for the very large size of the bill, and for an extraordinary horny protuberance by which it is surmounted, nearly as large as the bill itself, and of cellular structure within. The rhinoceros hornbill (*Bucĕros rhinoceros*) is almost the size of a turkey, of a black color, except on the lower part of the belly and tip of the tail, which are white. It

Rhinoceros Hornbill (*Buceros rhinoceros*)

has a sharp-pointed, slightly-curved bill, about 10 inches long, and furnished at the base of the upper mandible with an immense appendage in the form of an inverted horn. The skeleton though bulky is very light, being permeated with air to an unusual degree. During incubation the female is plastered up in the hollow of a tree and fed by the male through a small aperture left for the purpose. The hornbills are of arboreal habit, and feed on fruits; but in captivity they take small reptiles, and the Abyssinian species even attacks snakes.

Hornblende (hôrn'blend), or Amphibole, one of the most abundant and widely diffused of minerals, remarkable on account of the various forms and compositions of its crystals and crystalline particles, and of its exceedingly diversified colors, thus giving rise to almost numberless varieties, many of which have obtained distinct appellations. It is sometimes in regular distinct crystals, more generally the result of confused crystallization, appearing in masses composed of lamina, acicular crystals, or fibres, variously aggregated. It enters largely into the composition and forms a constituent part of several of the trap-rocks, and is an important constituent of several species of metamorphic rocks, as gneiss and granite. In color hornblende exhibits various shades of green, often inclining to brown, white

and black with every intermediate shade; it is nearly transparent in some varieties, in others opaque; hardness about the same with felspar; specific gravity, 3.00. Its chief constituents are silica, magnesia and alumina. The principal varieties are hornblende proper, divided into three subvarieties, basaltic hornblende, common hornblende and hornblende slate; tremolite, actinolite, nephrite, pargasite and asbestos.

Hornbook (hôrn'bŭk), in former times the first book of children, or that in which they learned their letters; so called from the transparent horn covering placed over the single page of which it usually consisted, the whole being fixed to a wooden frame with a handle. It generally contained the alphabet in Roman and small letters, several rows of monosyllables, and the Lord's Prayer. The alphabet was usually prefaced with a cross, or was printed in the form of a cross; hence the term Christ-cross row, corrupted into *criss-cross* row, applied to the alphabet, and by extension to the hornbook.

Hornbook.

Horncastle (hôrn'kas-tl), a town of England, County of Lincoln, 21 miles east of the city of Lincoln. There is a considerable trade in corn and wool, and one of the largest horse-fairs in the United Kingdom is held annually in August. Pop. 3900.

Horne (hôrn), Richard Hengist, poet, dramatist, and miscellaneous writer; born at London about 1803; died in 1884. He was educated for the army at Sandhurst, entered the Mexican navy, and served during the war between Mexico and Spain. In 1828 he began his literary career, and produced several tragi-comedies of an ironical and satirical kind, and a large quantity of miscellaneous work. In 1843 he made his historic appeal to public judgment by publishing his epic *Orion* at one farthing. In 1844 *A New Spirit of the Age*, a critical work in which he was assisted by Miss Barrett (Mrs. Browning) and Robert Bell, appeared. In 1852 he took to gold-digging in Australia, still keeping in touch with his literary work. Of his many writings, the best known are *Orion*, *Cosmo de Medici*, *The Death of Marlowe* and *Prometheus*.

Horned Horse, the gnu (which see).

Horned Owl, a familiar name applied to several species of owls having two tufts of feathers on the head, supposed to resemble horns. See *Owls*.

Horned Pout. See *Catfish*.

Horned Screamer (*Palamedea cornuta*), a South American grallatorial bird having a long, slender, movable horn projecting from its forehead. Its voice is loud and shrill, and is uttered suddenly and with such vehemence as to have a very startling effect.

Horned Toad, a name given to a genus of lizards (*Phrynosoma*), of toad-like appearance, found in the United States west of the Mississippi. There are nine different species.

Hornell, a city of Steuben County, New York, 60 miles s. of Rochester. It is the trade center of a large farming region, and has large railroad repair shops, iron foundry, and manufactures of silk, gloves, shoes, leather, etc. Pop. 13,617.

Horner (hôr'nẽr), Francis, politician and economist, born at Edinburgh in 1778; died at Pisa in 1817. He studied for the Scottish bar, but, exchanging it for the English bar, took up his residence in London in 1803. He had early, with his friends Jeffrey and Brougham, declared his preference for Whig principles, and in 1806, when Mr. Fox came into office, obtained through ministerial influence a seat in Parliament. He became an authority on financial and economic matters; was chairman of the Bullion Committee of 1810, and was mainly the means of checking the evils of an inconvertible paper currency. He was one of the originators of the *Edinburgh Review*, for which he wrote many articles.

Hornet (hôr'net), an insect of the genus *Vespa* (*V. crabro*), much larger and stronger than the ordinary wasp. It is very voracious feeding on fruit, honey, etc., and preying on other insects. Hornets form their nest of a kind of paper-work in hollow trees and walls, and are able with their sting to inflict a painful wound, usually accompanied with considerable swelling.

Horn of Plenty. See *Cornucopiæ*.

Horn Silver, native chloride of silver, so called because when fused it assumes a horny appearance.

Hornstone. See *Quartz, Chert*.

Hornwork, in fortification, a work with one front only

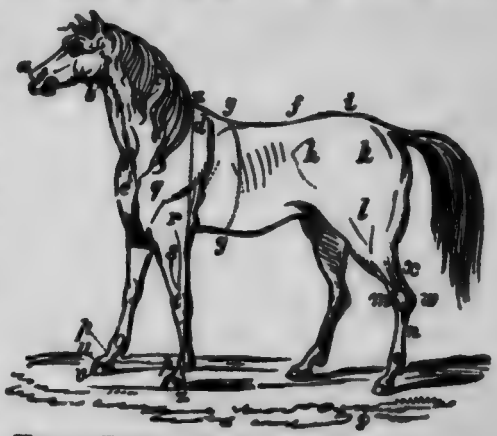
thrown out beyond the glacis for the purpose of either occupying rising ground, barring a defile, covering a bridge-head, or protecting buildings.

Horology (hor-ol'ō-ji). See *Clock* and *Watch*.

Horoscope (hor'u-skōp), in astrology, a scheme or figure or the twelve houses, or twelve signs of the zodiac, in which is marked the disposition of the heavens at a given time and place, and by which astrologers formerly told the fortunes of persons, according to the position of the stars at the time of their birth. To each of the houses was assigned a particular virtue or influence. The ascendant was that part of the heavens which was rising in the east at the moment; this was the first and most important house, or house of life, and contained the five degrees above the horizon and the twenty-five beneath it. Other houses were those of riches, marriage, death, etc.

Horsa. See *Hengist*.

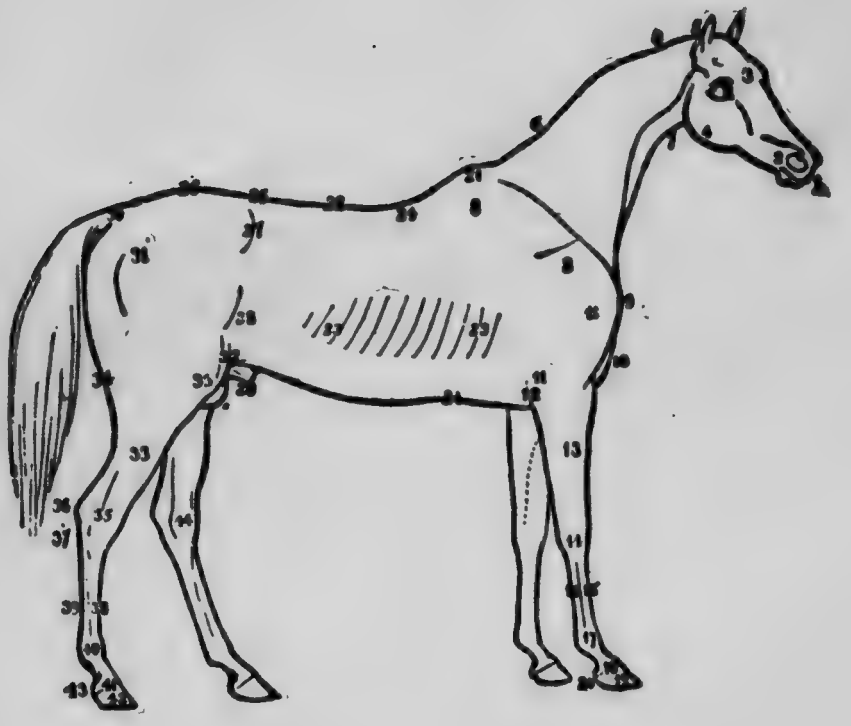
Horse (*Equus caballus*), a well-known quadruped belonging to the family Equidæ, order Ungulata (hoofed animals), and subdivision Perissodactyla (odd-toed); characterized by an undivided hoof formed by the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth in each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the male, rarely in the female. The family includes also the asses and zebras, and original types appear to have been at one time common in both the Old World and the American continent. No horses existed in America when it was discovered by Columbus, those now found in a wild state there being descendants of those introduced by the Spaniards. But a number of fossil species have been described from America—one of them standing only two and a half feet in height. The descent of the present horse can be traced through several fossil forms back to an animal only about the size of a fox, and having four separate digits or toes on the feet. Subsequent forms show how the third toe developed at the expense of the others till eventually a form identical with the common horse appeared. It is doubtful whether the horse is now anywhere to be found in its native state, the wild horses of the steppes of Tartary and other regions of the Old World being possibly descendants of animals escaped from domestication. The horse was probably first domesticated in Asia, and it varies much in form, size, and character with the climate and nature of the district it inhabits. Arabia produces perhaps the most beautiful breed, which is also swift, courageous, endurant and persevering. As bred in modern times the horse has attained high perfection. Two breeds—namely, the large, powerful, black breed of Flanders, and the Arabian—have contributed more than all others to develop the present varie-



Horse—Terms Applied to Different Parts.

a, Muzzle. *b*, Gullet. *c*, Crest. *d*, Withers. *e*, Chest. *f*, Loins. *g g*, Girth. *h*, Hip or ilium. *i*, Croup. *k*, Haunch or quarters. *l*, Thigh. *m*, Hock. *n*, Shank or cannon. *o*, Fetlock. *p*, Pastern. *q*, Shoulder-bone or scapula. *r*, Elbow. *s*, Fore thigh or arm. *t*, Knee. *u*, Coronet. *v*, Hoof. *w*, Point of hock. *x*, Hamstring. *s s*, Height.

ties from the original, comparatively light-limbed, wiry race. The former laid the foundation of size, strength and vigor for draught horses and for those anciently used in war, while the latter conferred speed and endurance. The ladies' palfrey is largely derived from the Spanish genet, a small, beautiful, fleet variety of the Moorish barb. The hunter, characterized by speed, strength and endurance, represents the old English, Flanders and Arabian breeds. The race horse has less of Flemish and more of Arabian blood. Horses are said to have 'blood' or 'breeding' in proportion as they have a greater or less strain of Arab blood. At the age of two years the horse is in a condition to propagate. The mare carries her young eleven months and some days, continues to breed till the age of sixteen or eighteen years, and lives on an average between twenty and thirty years. The various species of the horse family have been artificially crossed by man, and are found to be fertile with each other; the offspring, however, are generally sterile.



POINTS OF THE HORSE.

HEAD.

1. Muzzle.
2. Nostril.
3. Forehead.
4. Jaw.
5. Poll.

NECK.

6. 6. Crest.
7. Thropple or windpipe

FORE-QUARTER.

8. 8. Shoulder-blade.
9. Point of shoulder.
10. Bosom or breast.
11. 11. True-arm.
12. Elbow.
13. Forearm (arm).
14. Knee.
15. Cannon-bone.
16. Back sinew.
17. Fetlock or pastern-joint.
18. Coronet.
19. Hoof or foot.
20. Heel.

BODY OR MIDDLEPIECE.

21. Withers.
22. Back.
23. 23. Ribs (forming together the barrel or chest).
24. 24. The circumference of the chest at this point, called the girth
25. The loins.
26. The croup.
27. The hip.
28. The flank.
29. The sheath.
30. The root of the dock or tail.

THE HIND-QUARTER.

31. The hip-joint, round, or whirl-bone
32. The stifle-joint.
33. 33. Lower thigh or gaskin
34. The quarters.
35. The hock.
36. The point of the hock.
37. The curb place.
38. The cannon-bone.
39. The back sinew.
40. Pastern or fetlock-joint.
41. Coronet.
42. Foot or hoof.
43. Heel.
44. Spavin-place.

The horse is, strictly speaking, an herbivorous animal, and is more scrupulous in the choice of his food than most other domestic quadrupeds. The staple diet on which horses are kept is oats and hay, with beans added for horses subjected to heavy work. As a substitute for, or an addition to the regular food, bran, linseed and carrots are used. The age of a horse can be told by the marks on its teeth, which change a little yearly until the animal is about nine years old, after which period it is difficult to determine the age by mark. In some countries the flesh of the horse is used as food; the hide is made into leather; and the hair of the mane and tail is used for making haircloth, for upholsterers' stuffing, etc.

Horse-chestnut, a handsome genus of trees or shrubs (*Æsculus*) belonging to the nat. order Sapindaceæ, having large opposite digitate leaves, and terminal panicles of showy white, yellow, or red flowers. *Æ. Hippocastanum* (the common horse-chestnut) is familiar to every one. The seeds are large and farinaceous, and have been used as food for animals; they are bitter, and the bark is also bitter, astringent and febrifugal. The tree is said to have been brought from Constantinople to England in the beginning of the sixteenth century, and is supposed to be a native of Northern Asia. Three other species are found in North America, where they are popularly known under the name of *Buckeye*.

Horse-fly, the *Hippobosca equina*, a winged genus of the family Hippoboscidæ, parasitical on the horse.

Horse-guards, the name given to the public office, Whitehall, London, appropriated to the departments under the commander-in-chief of the British army; applied also to the military authorities at the head of the war department, in contradistinction to the civil chief, the secretary-at-war. The name was given to the building from a guard having been kept there by the horse-guards. See *Guards*.

Horse-latitudes, a space in the Atlantic Ocean between the westerly winds of higher latitudes and the trade-winds, notorious for baffling winds and tedious calms.

Horse Mackerel. See *Blue-fish* and *Scad*.

Horsens, a seaport in Denmark, east coast of Jutland, on a fiord of the same name, 25 miles S. W. of Aarhuus. It has manufactures of tobacco and a good general trade. It is the birthplace of Vitus Behring, the discoverer of Behring Strait. Pop. 22,243.

Horse-power, the power of a horse or its equivalent; the force with which a horse acts when drawing. The mode of ascertaining a horse's power is to find what weight he can raise and to what height in a given time, the horse being supposed to pull horizontally. From a variety of experiments of this sort it is found that a horse, at an average, can raise 160 lbs. weight at the velocity of 2½ miles per hour. The power of a horse exerted in this way is made the standard for estimating the power of a steam engine. Thus we speak of an engine of 60 or 80 horse-power, each horse-power being estimated as equivalent to 33,000 lbs. raised one foot high per minute. Engineers differ widely in their estimate of the work a horse is able to execute. That given above is the estimate of Boulton and Watt based on the work of London dray-horses, but it is considered much too high, 17,400 foot-pounds per minute being generally considered nearer the truth. As it matters little, however, what standard be assumed, provided it be uniformly used, that of Watt has been generally adopted. The general rule for estimating the power of a steam engine in terms of this unit is to multiply together the pressure in pounds on a square inch of the piston, the area of the piston in inches, the length of the stroke in feet, and the number of strokes per minute, the result divided by 33,000 will give the horse-power, deducting one-tenth for friction. As a horse can exert its full force only for about six hours a day, one horse-power of machinery is equal to that of 4.4 horses. *Nominal* or *calculated horse-power* is a term still used, but of little real value, from its being calculated on steam at a pressure much below the real power exerted. Sometimes the *real*, *actual*, or *indicated horse-power* exceeds the *nominal* by as much as three to one.

Horse-racing, a sport of ancient origin, having been practised among the Greeks and Romans. The institution of horse races in England belongs to a very remote period. The first regular horse races, however, did not take place till the reign of James I. The prize then consisted of a gold or silver bell, whence we have the expression 'to wear away the bell.' The successors of James I down to Queen Anne were all more or less attached to the sport. Under George I horse-racing became more and more flourishing, and the sport continued to grow in importance during the remainder of the century. The two most celebrated horses of that period were Flying Childers (foaled in 1715)

and Eclipse (foaled in 1764), which long had the reputation of being the fleetest horses that ever ran. The former ran four miles in 6 min. 48 sec., carrying 9 st. 2 lbs. The latter was never beaten. None of the English sovereigns was more devoted to horse-racing than George IV. Between 1784 and 1792, while yet Prince of Wales, he gained 185 prizes, including the Derby of 1788. Horse-racing was introduced into France from England, and during the reign of Louis XIV, and still more during that of Louis XV, was pursued with the utmost enthusiasm. The revolution put an end to it for a time, but the sport was revived by Napoleon. Horse-races, mostly upon the English model, have also been introduced into various other countries. The principal varieties of horse-racing are flat-racing, or racing on level ground; steeple-chasing, or racing over ground not specially prepared for the purpose; hurdle-racing, in which the horses have to leap over obstacles purposely placed in the way; and match trotting. This last kind of race is a very favorite one in the United States, where the best trotting horses are to be found, but in England it is not much practised. Formerly all races were what is called weight-for-age races, that is, a specified difference in weight was conceded by the older horses. But it was found that when races were conducted on this plan the best horses came to be known, and the inferior ones withdrew, not venturing to compete with them, so that the race resulted in a walk-over. Hence arose the practice of handicapping, that is, of adjusting as nearly as possible the weight to be carried to the previously ascertained powers of the horse, so as to reduce the chances of all the horses entered to an exact equality. Since the introduction of this practice, handicap races have become a very favorite sport.

In the American colonies racing was introduced early in the eighteenth century, and was practiced to some extent in Maryland and Virginia by the middle of the century. Bully Rock, the first American thoroughbred, was imported in 1730, and Bonny Lass, a brood mare of fine pedigree, about 1740. After this time racing stock was frequently imported and the racing area extended from New York to the Carolinas. After the Revolutionary war many fine racers were brought over and the stock of blooded horses rapidly increased. But it was the development of the trotting horse to which the chief attention was paid in the United States, and in its trotters this country has grown preëminent. The American trotter began its career in the importation to Philadelphia of the English thoroughbred Messenger in 1788. He was 8 years old when brought over and was used in breeding for 20 years. The trotting instinct appeared in nearly all his descendants and it is to the Messenger stock that much the greater part of the notable trotters in this country is due. The first record of a public trotting match was in 1818, when the gray gelding Boston Blue made a mile in 3 minutes. Such a feat was at that time thought impossible and when 2.40 was reached. in 1824, this became a popular phrase signifying marvelous speed. Edwin Forrest trotted a mile in 2.31½ in 1834, while Lady Suffolk made a record of 2.26½ in 1843. Year after year after this the time was cut down, though by small amounts. Dexter in 1867 made a mile in 2.17¼; in 1885 Maud S. cut this down to 2.08¾, and finally in 1897, Star Pointer crossed the 2 minute goal, making a mile in 1.59¼, and Lou Dillon, in 1903, in 1.58½. Pacing records have reached the still lower level of 1.55, made by Dan Patch in 1906. Running is a faster pace than trotting, and the American running record has reached the low limit of 1.35½. This was made by Salvator, at Monmouth Park, in 1890.

Horseradish (*Cochlearia armoracia*), a common garden herb, acrid and stimulating in character. It is used in pharmacy in the preparation of compound spirit of horseradish. Horseradish is used in a fresh state as a condiment with meats.

Horse-tail, among the Turks and other Eastern nations, the tail of a horse mounted on a lance, and used as a standard of rank and honor. The three grades of pashas are distinguished by the number of tails borne on their standards, three being allotted to the highest dignitaries or viziers, two to the governors of the more important provinces, and one only to those of the less important districts of the country.

Horse-tail Standard of Pasha.

Horsham (hôrs'am), a town of England, in the county of Sussex, on a branch of the river Arun, 37 miles S. S. W. of London, and 22 miles N. W. of Brighton. It formerly sent a member to parliament, and now gives name to a parliamentary division of the county. Pop. (1911) 11,314.

Horsley (hôrs'li), SAMUEL, English bishop, born in 1733; died in 1806. He was educated at Cambridge, and in 1759 became rector of Newington Butts. In 1767 he was chosen a fellow of the Royal Society, of which he was appointed secretary in 1773. After several charges he was appointed in 1788 Bishop of St. David's, from which he was translated to Rochester in 1793, receiving at the same time the deanery of Westminster; and finally to St. Asaph in 1802, when he resigned his deanery. Dr. Horsley was the greatest theological controversialist of his day, and is famous for his controversy with Priestley on Unitarianism. He published numerous sermons, and several works on Biblical criticism, besides editing an edition of Sir Isaac Newton's works.

Horta (hor'ta), a town in the Island of Fayal, one of the Azores, on the shores of a small bay between two rocky headlands. It has a tolerable harbor, and exports wine, oranges and grain. Pop. 6734.

Hortense (or-tons). EUGENIE DE BEAUHARNAIS. See under *Beauharnais*.

Hortensius (hor-ten'she-us), QUINTUS, a Roman orator, born of an equestrian family B.C. 114; died B.C. 50. He held many military and civil offices, and was elected consul for the year 69 B.C. In the previous year he had been engaged to defend Verres during the famous prosecution in which Cicero acted for the accusers. Hortensius continued to maintain a generous and friendly rivalry with Cicero, acknowledging his superior oratorical powers without jealousy. His speeches are all lost.

Horticulture (hor'ti-kul-tūr; from L. *hortus*, garden, and *colere*, to till), or GARDENING, includes, in its most extensive signification, the cultivation of esculent vegetables, fruits, and ornamental plants. In large gardens there are generally separate departments for flowers, fruits and vegetables; but in small gardens they are usually more or less combined. A garden should be either on a level, but admitting of effectual drainage, or on a gentle slope, preferably on the lower portion of a slope facing the sun. It should be well sheltered, either naturally from situation or artificially by means of plantations, walls, etc. The character of the soil is of much importance. A good loam, or a sandy loam mixed with humus, is the best. The former is better fitted for fruit-trees, but for early crops the sandy loam is desirable. While the greater part of a garden should consist of such soil, either naturally or artificially formed, it is useful to have a portion stronger and another much lighter in order to suit the requirements of different plants. The nature of the subsoil is also important. The best is a dry bed of clay overlying sandstone. Digging, ploughing and pulverising the soil, and exposing the surface to the action of the summer sun and the winter's frost are highly useful operations, by which the tenacity of stiff soils is overcome, weeds and insects are destroyed, and a quantity of air is admitted into the ground. Nutritive matter is frequently supplied to plants in the form of manure, either organic or inorganic. After the soil is properly dry and pulverized, the seeds are deposited, and this should always be done in dry weather, for a dry soil is especially requisite for covering in the seeds. Watering is often necessary as a means of nourishment to growing plants, especially as a support to newly transplanted vegetables, and for cleaning the leaves and destroying insects. The methods of propagating plants are various. For an account of the processes of budding and grafting see these articles. Another mode of propagation is that by means of cuttings, or shoots cut off and planted in the soil, where they take root. This process is exceedingly simple and easy in the case of many trees, as the willows and poplars; but requires some management in the heaths, myrtles, and other shrubs. In growing ornamental plants and flowers and exotic fruits, plant-houses of various kinds are necessary. These comprise the numerous forms of conservatory, plant-stove, greenhouse, pits and frames. Horticultural tools, instruments, implements and machinery are very various.

Hortus Siccus. See *Herbarium*.

Horus (hôr'us), the Latinized form of *Har*. the day, or the sun's path, an Egyptian divinity. Two gods were latterly recognised under the name. The elder Horus was the son of Seb (identified by the Greeks with Kronos) and Nu (Rhea) and brother of Osiris. The other Horus was the son of Osiris and Isis, and is supposed to have come into the world soon after the birth of his parents. On the death of Osiris he was his avenger, defeating the serpent

Typho, and enabling Isis to thwart his wicked designs. Both the elder and younger Horus were regarded as symbols of the sun.

Horus Apollo. See *Horapollo.*

Hosanna (hō-zan'a), a word composed of two Hebrew words occurring in Psalm cxviii, 25, signifying 'save now.' The psalm was sung on joyful occasions, and particularly at the feast of Tabernacles. The phrase is used as an exclamation of praise to God, or an invocation of blessings.

Hosea (hō-sē'a), the first in order among the minor prophets of the Old Testament, but probably the third in order of time, flourishing about 750 B. C. Nothing is known of his life, except that he was the son of Beeri, and that his ministry belonged to the reigns of Uzziah, Jotham, Ahaz and Hezekiah, kings of Judah. The nation generally and the ten tribes in particular are reproved, exhorted, and threatened in his prophecy. He predicts the approaching exile of his countrymen, and the consoling promise of the final return of an improved people.

Hoshangábád (hō-shang'ä-bäd), chief town and headquarters of district of the same name, Central Provinces of India, on the Nerbudda. It is a chief seat of the British piece-goods trade, and does business in cotton, grain, etc. Pop. about 15,000. The district has an area of 4437 sq. miles.

Hoshiarpur (hō'shē-ar-pör), chief town and seat of administration of district of same name, Punjab, India. Pop. about 20,000. The district has an area of 2180 sq. miles.

Hosiery (hō'zher-i), a general term all kinds of knitted articles, including drawers, petticoats, nightdresses, etc., and fancy articles such as head-dresses, hoods, shawls, neckerchiefs, watch-guards, cravats, etc. The materials used for the purpose are cotton, linen and wool, the last of which is sometimes mixed with cotton or silk. Silk is also frequently used alone. Nearly all articles of hosiery, except some fancy articles, are now made by a knitting-frame of some kind or other.

Hosmer (hos'mer), HARRIET, sculptor, born at Watertown, Massachusetts, in 1831. She studied at Rome, and among her best-known works are ideal heads of *Daphne and Medusa, Puck*, the *Sleeping Faun, Waking Faun, Beatrice Cenci*, etc. She died in 1908.

Hospice (hos'pis), signifies either a little convent belonging to a religious order, occupied by a few monks, and destined to receive and entertain traveling monks; or houses of refuge and entertainment for travelers on some difficult road or pass, as the Hospice of the Great St. Bernard.

Hospital (hos'pi-tal), any building appropriated for the reception of any class of persons who are unable to supply their own wants, and are more or less dependent upon public help to have those wants supplied. Hence hospitals are of various kinds, according to the nature of the wants they supply and the class of persons for whom they are intended. A large number of hospitals are medical; others are for the reception of incurables; others for the aged and infirm; others for the education of children of people in reduced circumstances; others for the reception of the wounded in battle; and so on. The first establishments of this nature are believed to belong to the fourth century after Christ. Their primary object was to afford a shelter to strangers and travelers, and it was only occasionally that the sick and infirm were admitted. One of the earliest hospitals of which we have any satisfactory information was that established by the emperor Valens at Cæsarea about the end of the fourth century, and which was conducted on a very large scale. The Arabs in Spain, at an early period of their occupation of that country, founded a magnificent hospital at Cordova, where physicians were trained, who did a vast deal to advance the study of medicine. The Arabs have also the credit of having founded the first lunatic asylum in Europe, which was erected in the city of diseases), fever and smallpox hospitals, everywhere are medical, often called infirmaries. These may be divided into general and special hospitals, the former class admitting cases of all kinds; the latter class admitting only patients suffering from some special trouble. Thus there are lying-in hospitals, cancer, consumption, ophthalmic, lock (for venereal diseases), fever and smallpox hospitals. There are also hospitals for children, and for persons suffering from incurable diseases. Such institutions serve a double purpose, inasmuch as they not only afford the best medical advice and treatment to the poor, who would otherwise be unable to obtain it, but also supply the best means of giving instruction in medicine and surgery, as in them students have the opportunity of witnessing cases of nearly every variety of disease, and observing how they are treated by the most skilled physicians and surgeons. For this reason a good infirmary or medical hospital is an indispensable adjunct

to every school of medicine and surgery. Hospitals for the sick and hurt are usually divided into wards, each containing a larger or smaller number of beds. Medical and surgical wards are usually kept separate, and all contagious diseases are treated by themselves in distinct buildings. Each hospital has a matron, house surgeon, and apothecary resident within its walls. The duties of the matron consist in regulating the night and day nurses, and the washing and laundry department, as well as the purchase of the necessary supplies of provisions, and keeping a general superintendence over the kitchen and messes of the sick. The house surgeon takes care of all casualties and accidents in the absence of the principal surgeons. The apothecary takes care of the pharmacy and prepares all the medicines prescribed from time to time by the surgeons and physicians. There is a well-lighted room set apart for the performance of operations, and a mortuary for the reception of corpses previous to interment. The nurses relieve each other day and night in a regular manner. Particular wards are set aside for the reception of persons laboring under various and peculiar denominations of disease. It has been objected to the present plan of constructing large edifices for hospital purposes, that the benefit they confer is greatly diminished by the risk of being attacked by hospital diseases, fever, erysipelas, pyæmia, etc., to which the patients are exposed; and the cottage or hut system of construction has been strongly advocated. This form of hospital consists of temporary detached huts or cottages which could be easily removed or replaced. Difficulties in connection with expense and administration have made this system impracticable. The pavilion system of construction is a compromise between the large blocks and the cottages or huts. According to this system the wards should be separated from the administrative part of the establishment, and should be arranged in pavilions of one story where practicable, but never more than of two. The pavilion should always surround the administrative blocks. This mode of construction is equally applicable to large and small establishments. The Royal Infirmary of Edinburgh, the Herbert Hospital of Woolwich, and the New York Hospital are among the best examples of the pavilion style. Convalescent homes, where patients are reinvigorated by a short stay after being cured in the infirmary, may be regarded as supplementary to medical hospitals, and among subsidiary institutions are dispensaries (which see) and schools for the training of nurses. Special hospitals for the insane are necessary. Hospitals or asylums for inebriates have also been organised; likewise hospitals for opium habitues, and those addicted to the use of other narcotics. The subject of the proper training of nurses has received great attention. Training schools have been organised in connection with nearly all the larger American hospitals and to the special work of nurses within the hospitals has been added that of social service, which follows discharged patients, into their homes and seeks to improve conditions there, so that recovery may be full and the patient not returned to the hospital for further treatment. Most hospitals in the city maintain an ambulance, or large covered wagon, equipped with a bed, instruments and restoratives, for the transportation of the sick or wounded to the hospital, each ambulance being provided with a surgeon, who applies first aid and cares for the patient en route.

Military and Naval Hospitals or establishments for the reception and care of sick and wounded soldiers and seamen, have been in existence in all civilized countries for a long period. Military hospitals are either permanent or temporary establishments. Permanent hospitals are established at army posts or forts, as also at certain other places. Field hospitals are constructed at the scene of an engagement as may be demanded, and are transported from point to point. They usually consist of tents, with stretchers for conveying the wounded. Station hospitals are established at intervals during a campaign, between the seat of war and the base of supplies, and patients are conveyed from the field hospitals to them as occasion requires. *Hospital ships* are ships fitted out as hospitals in all expeditions beyond the sea. By intelligent treatment the mortality in war has rapidly decreased.

Hospitallers (hos-pi-tal'ėrs), charitable brotherhoods who devote themselves to tend the sick in hospitals. The name is specially applied to an order of knights, the Knights of St. John. See *John, Knights of St.*

Hospodar (hos'po-dar), a title of dignity borne by the vassal princes of Moldavia and Wallachia while those states were subject to Turkey, and in earlier times by the princes of Lithuania and the kings of Poland.

Host (hōst; Latin *hostia*, a sacrificial victim), a term used for the bread (or wafer) and wine in the eucharist, as containing the body and blood of Christ. As the wafer alone is

given to laymen in the Roman Catholic Church, as containing both the body and blood of the Redeemer, the term *host* is usually applied to the consecrated wafer. See *Elevation*, *Mass*.

Hostage (hŏst'aj), a person left as pledge or surety for the performance of the articles or conditions of a treaty. The taking or giving of hostages is now scarcely known in the relations of modern communities, but was formerly almost universal, and many questions in the law of nations arose out of the practice. If the stipulated terms were observed the hostages were returned on each side, but if the terms were violated or evaded the hostages might be put to death.

Hostilius. See *Tullus Hostilius*.

Hot Air Engine an engine in which the expansion of heated air is used as the motive power. Several devices of this kind have been invented, of which the most successful has been that of Ericsson. This has been considerably improved, and is now in use to some extent where small power is needed. There are several others in use, that of Belom being the only one used to furnish large power for an important industry, a large paper manufactory at Cusset, France. The chief advantage of the hot air engine is that it requires no boiler, and thus escapes the weight and danger incident to this necessity of a steam engine. On the other hand, the pressure to be obtained from hot air is much less than that of steam, and the working parts need to be much larger. But air engines are cheaper to make, more easily managed, and need less care than steam engines.

Hotbed, in gardening, a bed of earth heated by fermenting substances, such as fresh stable dung, tanners' bark, leaves of trees, etc., and covered with glass to defend it from the cold air; intended for raising early plants, or for nourishing exotic plants of warm climates, which will not thrive in cool or temperate air.

Hot Blast, a stream of air heated to 500° or 600° F., and forced through a furnace. It saves heat and accomplishes the reduction of refractory ores in less time and with less fuel than the cold blast.

Hotchkiss, BENJAMIN BERKELY, inventor, born at Watertown, Connecticut, in 1826. The most notable of his inventions were the Hotchkiss magazine rifle and Hotchkiss machine gun. He made many improvements in projectiles and heavy ordnance. He died in 1885.

Hothouse, a building for the cultivation of plants too delicate to grow in the open air. It is built chiefly of glass, and resembles a greenhouse in its structure and arrangements, except that artificial heat is kept up all the year round.

Hot Springs, a city and noted health resort, capital of Garland county, Arkansas, 54 miles s. w. of Little Rock. The springs number 72, their water varying from 76° to 157° F. It is clear, tasteless and odorless, and is credited with curing rheumatism, gout, neuralgia and other chronic diseases. Fine novaculite (oilstone) is found here, and hones are manufactured. Lead and silver also occur. Pop. 16,384.

Hotspur. See *Percy*.

Hottentots (hot'en-tots), a peculiar African race, supposed to be the aboriginal occupants of the south end of Africa, at and near the Cape of Good Hope. Their limits may be said to have been the river Orange on the north and northeast, and the Kei on the east. When young they are of remarkable symmetry; but their faces are ugly, and this ugliness increases with age. The complexion is a pale olive, the cheek-bones project, the chin is narrow and pointed, and the face consequently is triangular. The lips are thick, the nose flat, the nostrils wide, the hair woolly, and the beard scanty. When the Dutch first settled at the Cape in the middle of the seventeenth century the Hottentots were a numerous nation, of pastoral and partially nomadic habits, and occupied a territory of 100,000 square miles. At the present day this race is nearly extinct within the wide territory which formerly belonged to it, having been entirely hunted out and dispersed by the Boers. Among the offshoots of the Hottentot race are the Griquas, descended from Hottentot mothers and Dutch fathers, living to the north of the Orange river. They are semicivilized, and have some towns and villages. The Koras or Korannas, higher up the river Orange or Gariep, still remain a favorable specimen of the Hottentot race. They are taller, stronger, and more cleanly than the tribes further west. Other tribes are the Gonas or Gonaquas, much mixed with the Amakosa Kaffirs; the Namaquas, dwelling towards the mouth of the river Orange; the Hill Damaras, farther north. The diminutive Bushmen are related in speech to the Hottentots. The language of the

Hottentots is peculiar, consisting of a system of clicks or clucks.

Hottentot's Bread. See *Testudinaria*.

Houghton (hō'tun), RICHARD MONCKTON MILNES, Lord, only son of Robert Pemberton Milnes, of Fryston Hall and Great Houghton, was born in Yorkshire in 1809, and educated at Cambridge. He made some reputation as a writer of verse, essays, memoirs, etc., but it was rather his social and conversational powers, and his kindly patronage of literary aspirants, than the merit of his writings which gave him his prominent position in London society. In 1837 he entered parliament as member for Pontefract, at first as a Tory, but afterwards as a supporter of Russell and Palmerston. He was an active member of numerous learned societies and institutions, president of the Royal Society of Literature, trustee of the British Museum, foreign secretary of the Royal Academy, etc. He died in 1885.

Houghton, a village, capital of Houghton County, Michigan, on the s. shore of Portage Lake, from which is a ship canal to Lake Superior. It is the seat of very productive copper mines, with smelters. The Michigan College of Mines is located here. Pop. 5113.

Houghton-le-Spring, a market town of England, in the county of Durham, 6½ miles N. E. of Durham. The prosperity of the town depends on the numerous coal mines in the neighborhood. Pop. (1911) 9753.

Houlton, a village, capital of Aroostook County, Maine, 10 miles W. of Woodstock, N. B. It has a trade in farming and lumber products and starch is produced. Pop. 5845.

Houma, a town, capital of Terrebonne County, Louisiana, 70 miles S. W. of New Orleans. It is in a sugar-cane and rice country, and sugar and molasses are produced. Pop. 5024.

Hound (*Canis sagax*), a name given generally to hunting dogs, but restricted by scientific writers to such as hunt by scent, a definition which excludes the greyhound. Among the varieties are the bloodhound, staghound, foxhound, harrier and beagle. Hounds are distinguished not only by their fineness of scent, but by docility and sagacity. Of the rough-haired and smooth-haired varieties, the former manifest the greatest affection for man.

Hounds-tongue, a plant, so called from the shape of its leaves. See *Cynoglossum*.

Hounslow (hounz'lō), a town of England, in Middlesex, 9 miles southwest of Hyde Park Corner, London. The adjoining Hounslow Heath, once notorious for the highway robberies

Deerhound (*Canis sagax*).

committed on it, is now entirely enclosed, and is the site of large cavalry barracks and extensive powder mills.

Hou-Pe (hō-pā'), HU-PEH, or HOO-PE (North of the Lakes), a central province of China. It is intersected by the Han-kiang and the Yang-tse-kiang, and is considered one of the most fertile parts of the empire. Area, about 70,000 sq. miles. Pop. estimated at 34,000,000.

Hour (our), the twenty-fourth part of a day (see *Day*). In most countries the hours are counted from midnight to mid-day, and twelve hours are twice reckoned. But in some parts of Italy twenty-four hours are counted, beginning with sunset, so that noon and midnight are every day at different hours. Each hour is divided into sixty minutes, and each minute into sixty seconds.

Hour-circle. See *Globe*.

Hour-glass, an instrument for measuring time, consisting usually of two hollow bulbs placed one above the other, and having a narrow neck of communication through which a certain quantity of dry sand, water, or mercury is allowed to run from the upper to the lower bulb, the quantity of sand being adjusted so as to occupy an hour in passing from one bulb to the other. The hour-glass was commonly used in churches during the sixteenth and seventeenth centuries to regulate the length of the sermon.

Houris (hou'ris or hō'ris), the 'black-eyed' nymphs of Paradise, whose company, according to the *Koran*, is to be one of the rewards of the faithful. They are described as most beautiful virgins, endowed with perpetual

youth, and subject to no impurity. They dwell in beautiful gardens, by flowing streams, and the meanest of the faithful will have at least seventy-two of them.

Hours. See *Horæ.*

Hours, Canonical. See *Horæ canonicæ.*

House, Edward Mandell, born at Houston, Texas, in 1858, took an active part in Democratic politics in that state. While never holding office, he directed many campaigns for governor. During the European war, under the informal title of Colonel, he served in 1915 as the special representative of President Wilson in Europe and in December, 1917, became the chief American member of the International Council of the Entente Allies.

House Boat, a form of summer water residence now very popular. It consists of a flat-bottomed scow or float, on which is built a superstructure of several rooms, with balconies, awnings, etc., and often luxuriously furnished. During the pleasant season the house boat is moved from place to place on inland waters as desired. House boats are growing rapidly in favor in the United States and are very common on the Thames and some other rivers of England.

House-breaking. See *Burglary.*

Housefly. See *Fly.*

Household Gods, among the Romans, deities known as the Lares and Penates, and presiding over the fortunes of the house or family.

Household Suffrage, suffrage based on the occupancy of a house or a distinct part of a house for not less than a year. In Britain it was established in boroughs by the Reform Act of 1867, and extended to the counties in 1884. Lodgers occupying lodgings which would let unfurnished for £10 a year are also entitled to rank under this suffrage.

Household Troops. See *Guards.*

Houseleek (hous'lēk; *Sempervivum tectōrum*, nat. order Crassulaceæ), a succulent plant, commonly to be met with on old walls, the roofs of cottages, etc. The stem rises to the height of 8 or 10 inches, and bears a few purplish flowers, which have twelve or fifteen petals. The leaves are applied by the common people to bruises and old ulcers.

Housemaid's Knee, an acute inflammation of the bursa or sac between the knee-pan and the skin, so called because it is common among housemaids from their kneeling on hard, damp stones. It is treated like other local inflammations by counter-irritants, and if necessary incision. In all cases the limb ought to have complete rest.

House of Commons. See *Britain;* —section Parliament; also *Parliament.*

House of Correction, a prison for idle and disorderly persons, and certain classes of criminals, such as prisoners convicted of felony or misdemeanor, vagrancy, etc., or committed on charge of such. Originally vagrants, trespassers and convicted persons were detained in these houses that they might be compelled to work. They are sometimes called *bridewe'ls.* In England every county must have one. They have been adopted in the large cities of the United States.

House of Governors, The first suggestion of a body under this title was made in 1907 in a pamphlet by William George Jordan of New York, its purpose being to bring about harmony in state legislation and a closer unity of the States in all particulars. Such a convention of governors was called by President Roosevelt in November of the same year, its purpose being to consider the conservation of the natural resources of the country. The governors of 37 States and Territories attended this convention and the governors themselves called a second one, to be held in January, 1910. This adopted the title of House of Governors. Its purpose was to bring about, through state action, that political harmony which the general government has of late been striving to develop. A session was held at Spring Lake, N. J., in September, 1911, at which steps were taken towards establishing a permanent headquarters and provide for future meetings.

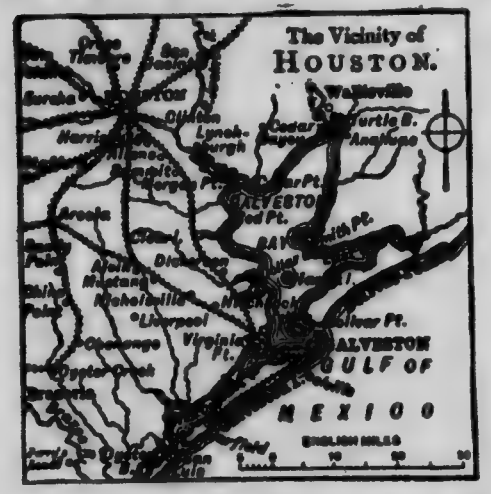
House of Lords. See *Britain;* also *Parliament.*

House of Representatives. See *Congress.*

Houssa, or Haussa (hous'sa), a region of Africa, in Central Soudan, between lat. 11° and 14° N.; and lon. 4° and 11° E. This country, though yet little known, is represented as extremely fertile, and skilfully cultivated. It is under the rule of the Fellatahs, who have subjected the native inhabitants, the Haussana or Haussas, a race intermediate between the negroes and the Berbers, but generally ranked with the

latter. They are intelligent and lively, expert weavers as well as agriculturists, and well acquainted with tanning and working in iron. Their language is rich and sonorous, and has become the general medium of commercial intercourse in Central Africa. They are Mohammedans. There are two large towns in Houssa—Sokoto and Kashna.

Houston (hūs'tun), a city of Texas, capital of Harris county, at the head of steamboat navigation on Buffalo Bayou, 48 miles northwest of the



important seaport of Galveston, and the great railway center of the State. It stands in an excellent grazing district, and contains iron-foundries, cotton-presses, machine-shops, car-wheel works, and other industrial establishments. It is a great shipping port for cotton, and rice and lumber are also shipped. Pop. 78,800.

Houston, Samuel, President of Texas, was born in Virginia in 1793, of Scotch-Irish descent. He was taken to Tennessee in childhood, studied law and practiced at Nashville, and became prominent in the State, being elected to Congress in 1823, and made governor in 1827. He subsequently resigned this office, lived several years among the Cherokee Indians, and in 1832 went to Texas. Here he was active in the revolt of Texas against Mexico, was chosen commander of the army and in 1836 defeated the Mexicans at San Jacinto, which resulted in the independence of Texas, of which he was elected President. In 1845 Texas entered the Union, and Houston was chosen United States Senator. He was elected Governor of Texas in 1859. In 1861 he was deposed for adherence to the Union. He died in 1863.

Houston Heights, a town in Harris County, Texas, a suburb N. W. of Houston. It is almost exclusively a residential town. Pop. 12,000.

Hovenden (h u v'en-den), Thomas, painter, born at Dunmanway, Ireland, in 1840, studied art at Cork and in New York, was elected a member of the National Academy in 1882. His *Breaking the Home Ties* was very popular. Other pictures were *The Last Moments of John Brown*, *Elaine*, *A Breton Interior*, etc. He was killed while trying to save a little girl from a railroad train, in 1895.

Howard (hou'ard), the patrician house that has been for centuries at the head of the English nobility. The first of the family of whom anything is certainly known is Sir William Howard, chief-justice of the common pleas under Edward I and Edward II. His grandson, Sir John Howard, possessed extensive property in Norfolk, and was also sheriff of the county. His grandson, Sir Robert Howard, by marrying the co-heiress of the Mowbrays, dukes of Norfolk, greatly increased the family possessions, and enhanced the family importance. Their only son, Sir John Howard, distinguished himself in the wars with France in 1452-53, and in 1470 was created Lord Howard, and made captain-general of the royal forces at sea. Adhering to the fortunes of Richard III he was in 1483 created Duke of Norfolk, and elevated to the high dignity of Earl-marshal of England, but two years after he was killed at Bosworth Field, and his blood and honors were attainted by parliament, 1485. A like attainder was decreed against his son Thomas, who had been created Earl of Surrey by Richard. Thomas, however, was restored to his titles and possessions, manifested high military talent, and distinguished himself, especially by his defeat of James IV of Scotland at Flodden in 1513. His son Thomas, third duke of Norfolk, obtained distinction both as a naval and military commander, and became High-admiral of England. But in spite of his services both at home and against the Scots and the French, Henry VIII at last condemned him, on slight grounds, to suffer the death of a traitor. The death of Henry prevented the execution, and he was reinstated in his rank and property by Queen Mary, and died in August, 1554. By his marriage with a daughter of Edward IV he became the father of the ill-fated and se-

complished Henry Howard, Earl of Surrey, the best English poet of his age. (See *Surrey, Earl of.*) Thomas, fourth duke of Norfolk, entertained the project of marrying Mary Queen of Scots, which led to him being convicted of high treason, and beheaded in 1572. The attainder was reversed and the family honors restored, partly by James I and partly by Charles II. The ducal house of Norfolk has thrown out many branches which have enjoyed, or still enjoy, the earldoms of Carlisle, Suffolk, Berkshire, Northampton, Arundel, Wicklow, Norwich and Effingham, and the baronies of Bindon, Howard de Walden, Howard of Castle Rising, and Howard of Glossop. As connected with this noble family we may mention Lord Howard of Effingham, who defeated the Spanish Armada in 1588; Catherine Howard, one of the ill-fated consorts of Henry VIII; and Sir Thomas Howard, who died in the Tower a prisoner, for having aspired to the hand of the Lady Margaret Douglas, daughter of Margaret, queen-dowager of Scotland, and niece of Henry VIII. 'The blood of the Howards' has become proverbial, as expressive of ancient lineage combined with high rank.

Howard, Bronson, playwright, born at Detroit, Michigan, in 1842; died in 1908. His best-known plays are *Saratoga, Young Mrs. Winthrop, Shenandoah* and *The Banker's Daughter.*

Howard, John, an English philanthropist, was born in 1726; and died in 1790. His father, a wealthy London tradesman, died when his son was about 19 years of age, and left him an independent fortune. In 1756 Howard undertook a voyage to Lisbon to view the effects of the recent earthquake. The vessel in which he embarked being captured, he was consigned to a French prison. The hardships he suffered and witnessed previously to his release first roused his attention to the subject of his future researches. In 1773 he resolved to devote his time to the investigation of the means of correcting the existing abuses in the management of prisons. With this view he visited most of the English county jails and houses of correction, and in March, 1774, he laid the result of his inquiries before the House of Commons, for which he received a vote of thanks. In 1775 and 1776 he visited many of the continental prisons, as well as those of Scotland and Ireland, and the substance of his investigations appeared in a work he published in 1777. This work was supplemented by his experiences of foreign prisons (1778-1783). In 1789 he published an *Account of the Principal Lazarettos in Europe,* with notes on Continental and British prisons and hospitals. In the same year he made a final journey through Germany and Russia, when prisons and hospitals were everywhere thrown open for his inspection as a friendly monitor and public benefactor. He died of fever at Cherson in South Russia.

Howard, Oliver Otis, soldier, born at Leeds, Maine, in 1830; died in 1909. He graduated at West Point, served in the Seminole war and through the Civil war, being made major-general of volunteers in 1862, commander of the Department of Tennessee in 1864, brigadier-general in the regular army in 1864, and major-general in 1886. He was commissioner of the Freedman's Bureau 1865-74, and Peace Commissioner to the Indians of Arizona and New Mexico in 1872. He retired in 1894.

Howard University, an institution established at Washington, D. C., in 1867, by Gen. Oliver O. Howard, while in charge of the Freedman's Bureau, for the liberal education of freedmen. As now conducted pupils are admitted without distinction of sex or color. In addition to the college course, there are courses in medicine, dentistry, pharmacy, law, theology and normal instruction. It has 105 instructors, 1200 students, a library of 30,000 volumes and an endowment of about $280,000.

Howe, Edgar Ward, novelist, born near Huntington, Iowa, in 1854. His chief works are *A Story of a Country Town, The Mystery of the Locks, Confession of John Whitlock,* etc. Editor and publisher of the *Atchison Daily Globe.*

Howe, Elias, an eminent inventor, was born at Spencer, Massachusetts, in 1819; died in 1867. After long experiment he succeeded in 1846 in perfecting a sewing machine, the first satisfactory one ever invented and the basis of all those that have followed. He was for several years involved in expensive and harassing lawsuits to establish his right to reap the benefits of his own ingenuity, but obtained a verdict in his favor in 1854, and subsequently grew wealthy from the royalties paid on his patent. He equipped a regiment at his own expense in the Civil war, and served in it as a private. Immense numbers of the Howe sewing machines are now manufactured and sold in America, Great Britain, and elsewhere.

Howe, Julia Ward, author and poet, was born in New York city

in 1819. She received a careful education, and at an early age wrote plays and poems. She was married to Dr. Samuel G. Howe, philanthropist, in 1843. She afterward continued her studies, writing philosophical essays. In 1861 she composed the popular *Battle Hymn of the Republic*, the favorite lyric of the Civil war. She died in 1910 at the advanced age of 91.

Howe, Richard, Earl (1726-99), an English admiral. He was made vice-admiral in 1775 and appointed commander-in-chief in America February, 1776. He conducted the English naval operations in the Revolution.

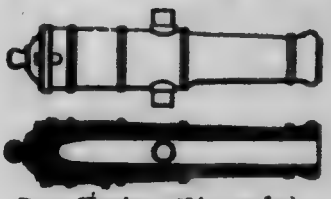
Howe, William, 5th Viscount (1729-1814), an English general; younger brother of George Augustus, 3d Viscount, killed in the Ticonderoga expedition of 1758, and of Richard, 4th Viscount, later Earl Howe, the admiral. Sent to America in 1758 he took part in the capture of Louisburg and accompanied Wolfe on his expedition to Quebec. In the Revolutionary war he commanded the British at Bunker Hill June 17, 1776, and in October became commander-in-chief, succeeding Gen. Gage. He won the battles of Long Island (1776), White Plains (1776), Brandywine (1777), and Germantown (1777). He was succeeded by Sir Henry Clinton (q. v.). See also *Burgoyne*.

Howells (how'elz), William Dean, novelist, was born at Martinsville, Ohio, in 1837. He learned the printer's trade with his father; was afterwards assistant editor on the *Ohio State Journal;* published a life of Abraham Lincoln and a volume of poems, and was appointed in 1861 consul at Venice. On his return to America in 1865 he joined the staff of the *Nation*, became afterwards editor of the *Atlantic Monthly* (1871-81), was editorial contributor to *Harper's Magazine*, 1886-91; editor for a time of the *Cosmopolitan*, and subsequently editor of the *Easy Chair of Harper's*. He became widely known as a writer of realistic novels. Among his many works are *Venetian Life* (1866), *Italian Journeys* (1867), *A Chance Acquaintance* (1873), *The Lady of the Aroostook* (1879), *A Modern Instance* (1883), *The Rise of Silas Lapham* (1885), *Literature and Life* (1902), *London Films* (1905), *Between the Dark and the Daylight* (1907), etc.

Howitt (how'it), Mary, an English writer, born in 1805, the daughter of Mr. Botham, a Quaker; was married in 1823 to Mr. William Howitt (see next article). Mary Howitt wrote a number of hymns and ballads, several volumes in prose and verse for children, and translated Miss Bremer's works and H. C. Andersen's *Improvisatore*. Among her writings for the young may be mentioned *The Children's Year*, *The Dial of Love*, *A Treasury of Tales for the Young*, etc. In conjunction with her husband she also wrote *The Literature and Romance of Northern Europe* and *Ruined Abbeys of Great Britain*. She died in 1888.

Howitt, William, born in 1792 of a Quaker family; began early to publish verses, and in conjunction with his wife (see above article) published shortly after their marriage a volume of poems—*The Forest Minstrel* (1823). In 1831 appeared his *Book of the Seasons*, in 1834 his *History of Priestcraft*, and in 1838 his popular *Rural Life in England*. In 1840 the Howitts settled at Heidelberg, and devoted themselves to introducing the literature of the north, especially of Sweden, to English readers. *Student Life in Germany* appeared in 1841, *Rural and Domestic Life in Germany* in 1842. In 1847 Mr. Howitt published his *Homes and Haunts of the British Poets*, and, after a visit to Australia, his *Land, Labor and Gold;* and *The History of Discovery in Australia*. He also wrote a *History of England*. In later life Mr. Howitt and his wife became converts to spiritualism. He died in 1879.

Howitzer (hou'it-ser), a short piece of ordnance, usually having a chamber for the powder narrower than the bore, specially designed for the horizontal firing of shells with



Brass Howitzer (24 pounder).

small charges, combining in some degree the accuracy of the cannon with the calibre of the mortar, but much lighter than any gun of the same capacity. The rifled gun, throwing a shell of the same capacity from a smaller bore, and with much greater power, has superseded the howitzer for general purposes.

Howler Monkey (*Myoetes*), a genus of South American monkeys, characterised by a remarkable loudness of voice, which is due to the presence of a large chamber within the hyoid bone and the enlarge-

ment of the ventricles of the larynx. In the tropical forests of America their hideous howls, probably a kind of amorous concert, may be heard during the night more than a mile away. They are prehensile-tailed, large and heavy of body, with a high pyramidal head flattened on the summit.

Howrah (hou'rä), a town of India, on the right bank of the Hugli, opposite Calcutta, of which it is practically a suburb, and with which it communicates by a floating bridge. It has large dockyards, jute and saw mills, and various manufactories. Pop. 157,-594.

Höxter (heuk'stêr), a town of Westphalia, Prussia, on the left bank of the Weser, once a Hanse town. Pop. 7699.

Hoy (hoi), a small vessel, usually rigged as a sloop, and employed in carrying goods and passengers short distances coastwise, and sometimes in conveying goods to and from larger vessels and the shore.

Hoy, an island of the Orkneys, Scotland, 3½ miles s. of Stromness. It is about 13 miles long and 6 broad; mountainous and healthy, but with fertile tracts. It has an excellent harbor, Long Hope. At the southwest of the island there is a detached pillar of rock 450 feet high, known as the Old Man of Hoy. Pop. 1380.

Hoya (hō'ya) a genus of Asclepiadaceæ, common in tropical Asia, and cultivated in hothouses on account of their ornamental appearance.

Hubbard, Elbert, author and publisher, born at Bloomington, Illinois, in 1859. He founded at East Aurora, New York, the famous Roycroft shop, devoted to making de luxe editions of the classics. He is editor of the *Philistine* and *Fra*, radical and free-spoken journals, and has written *No Enemy but Himself*, *Little Journeys to the Homes of Famous Women*, etc. He was drowned at the sinking of the Cunard line steamship *Lusitania*, which was torpedoed by a German submarine off the coast of Ireland, May 7, 1915.

Huanuco Bark, the gray or silver cinchona bark imported in the form of quills from around Huanuco in Peru. It is the produce of *Cinchona micrantha*.

Hubble-bubble. See *Narghile*.

Huber (hü'ber), François, a Swiss naturalist, born in 1750; died in 1821. Notwithstanding the loss of his eyesight, he was able, by the help of his wife and his reader and amanuensis, to make observations and deductions which constitute decidedly the most important contribution by any one man to our knowledge of bees. His first work was published in 1792 under the title of *Lettres à Ch. Bonnet*. Four years after his *Nouvelles Observations sur les Abeilles*, practically a new edition, enlarged and amended of the other, appeared. His son Pierre also assisted his father, and himself published important observations on ants.

Hubert (hü'bert), St., the patron of huntsmen. He was of a noble family of Aquitaine. While hunting in the forests of Ardennes he had a vision of a stag with a shining crucifix between its antlers, and heard a warning voice. He was converted, entered the church, and eventually became Bishop of Maestrich and Liége. He worked many miracles, and is said to have died in 727 or 730.

Hubertsburg (hü'berts-burg), formerly a hunting seat of the electors of Saxony, in the Leipzig district, now enlarged and divided into portions, used respectively as a public prison, a hospital, a lunatic asylum, etc. Here the Peace of Hubertsburg, which put an end to the Seven Years' war, was signed February 15, 1763.

Huc (ük), Évariste Regis, a French missionary and traveler, born in 1813. After studying theology, about 1837 he entered the order of the Lazarist Fathers, was ordained in 1838; in 1839 went to China as a missionary, and in company with Père Gabet made a journey of exploration in the interior of the empire and of Tibet. After this he returned in broken health to France, where he published *Travels in Tartary, Tibet and China*, a work which attained a wide popularity. He afterward published *The Chinese Empire* and *Christianity in China*. He died in 1860.

Huckleberry (huk'l-ber-i), an American name for the whortleberry (which see).

Huddersfield (hud'ers-fēld), a flourishing manufacturing town, in the West Riding of Yorkshire, England, 16½ miles southwest of Leeds. Among its institutions are two colleges for higher education, a technical school, etc. The town is the chief center of the fancy woolen trade. Broadcloths, doeskins, trouserings are also manufactured, and there are manufactories of steam engines, etc. Pop. 107,825.

Hudson (hud'sun), a town of Middlesex county, Massachusetts, 28 miles w. of Boston. It has manufactures of leather, rubber shoes,

webbing, gossamers, paper and wooden boxes, shoes, lasts, boats, etc. Pop. 6743.

Hudson, a city, capital of Columbia county, New York, on the E. bank of the Hudson River, 28 miles S. of Albany. It contains a State Armory, House of Refuge for Women and Firemen's Home, and has extensive manufactures, including clothing, paper, carwheels, machinery, etc., with several blast furnaces and iron foundries. It was settled in 1784, and was formerly engaged in the whale fishery and foreign trade. Pop. 11,417.

Hudson, HENRY, an English navigator, date of birth unknown. He sailed from London in the year 1607 in a small vessel, with only ten men and a boy, to discover the Northeast Passage, and proceeded beyond the 80th degree of latitude. In a second voyage he landed at Nova Zembla, but could get no further eastward. In 1609 he sailed from Amsterdam in the *Half Moon*, a vessel of about 80 tons, in the service of the Dutch East India Company, and discovered the Hudson River, which he ascended to the present site of Albany. He spent a month exploring the river and then returned to Europe. In 1610 he set out on another voyage in a ship called *Discovery* and reached Hudson Bay and Hudson Strait, where he wintered; but his crew mutinied after suffering many hardships, and set him adrift in a boat along with his son John and seven of the crew, none of whom was ever heard of again.

Hudson Bay, or HUDSON'S BAY, an extensive bay, or rather an inland sea, Dominion of Canada, extending between lat. 51° and 64° N., and lon. 77° and 95° W.; length, north to south, about 800 miles; greatest breadth, about 600 miles. Hudson Bay is open to navigation for 4½ months in summer (from middle of June to end of October), but is obstructed by drift-ice during the rest of the year. There are many islands, reefs and sand-banks. The shores on the east are high and bold; but those on the west, especially towards the south, are low and level. The white whale is found in its waters, and there is a considerable summer fishery.

Hudson Bay Company, an English trading company, chartered by Charles II, May 2, 1670. It had long a monopoly of the trade throughout the whole territory of North America whose streams flow into Hudson Bay, and at one time as far westward as the Pacific, with rights of governing and making war. In 1870 its authority was transferred by act of Parliament to the crown, and its territories incorporated in the Dominion of Canada. Its trade in furs is still very large. See *Fur Trade*.

Hudson Bay Territory. See *Northwest Territories*.

Hudson Falls, a village in Washington county, New York. Pop. 5189.

Hudson River, a river on the Atlantic coast of the United States. It rises, by two branches, in the northern part of the State of New York, in the Adirondack Mountains, about lat. 44° N. Two small streams unite to form the river, which is afterwards joined by the Schroon and Sacondaga. At Glen's Falls it has a fall of 50 feet, after which it runs almost due south to its mouth in New York Bay. Its whole course is over 300 miles; it is navigable as far as Albany, 145 miles, for the largest vessels. The banks of the Upper Hudson are high and rocky; and the scenery very picturesque. It was discovered in 1609 by Henry Hudson, after whom it was named.

Hué (hō-ā'), the capital city of Anam, on the river Hué, which is here navigable for small craft, 10 miles from its mouth in the Gulf of Tonquin. It was fortified in the present century in European style by French officers in the service of the king of Cochin-China. The circumference of the walls is upwards of 5 miles. The city has a considerable trade. Pop. (1911) 61,600.

Hue and Cry, in English law, the pursuit of a felon or offender, with loud outcries or clamor to give an alarm. This procedure is taken by a person robbed, or otherwise injured, to pursue and get possession of the culprit's person. At common law, a private person who has been robbed, or who knows that felony is committed, is bound to raise hue and cry under pain of fine and imprisonment. This is generally done by informing the next constable; and this process is recognized by the law of England as a means of arresting felons without the warrant of a justice of the peace. The same name is also applied to a paper circulated by the secretary of state for the home department announcing the perpetration of offenses.

Huelva (ŭ-el'vä), a seaport town of Southwestern Spain, capital of the province of same name in Andalusia. It has wide and well-built streets. There are manufactures of matting, ropes, sails, etc., a large trade in the exportation of copper ore; also in fruits and wine. The fisheries, mainly sardine and tunny, are

of considerable value. Pop. 21,357.—The province of Huelva is mountainous and well wooded in the north, and contains celebrated copper mines. In the south it is comparatively level, and has a rich alluvial soil. Pop. 260,880.

Huerta (hwär'ta), Victoriano, Provisional President of Mexico after the death of President Madero, was born, of Indian descent, in 1854, and graduated in 1876 from the Military College of Chapultepec. His first service in the field was in 1901, when as a colonel he took part in the campaign against the insurgent Yaquis, and afterwards against the Mayas. His life, however, was chiefly passed in scientific work for the army until 1910, when, as a brigadier general, he took part in the field in the service of President Diaz against the Madero revolutionists. He commanded the guard that accompanied Diaz to Vera Cruz after his resignation, and subsequently served under President Madero, taking an active part in the uprisings of 1912 and 1913; but on February 18, 1913, turned traitor to Madero, seized and imprisoned him, and was proclaimed Provisional President by his fellow conspirators. The subsequent assassination of Madero was widely believed to be due to the instigation of Huerta. He was never recognised as president by the United States and was forced to resign in July, 1914. He was imprisoned in El Paso, Texas, in 1915, charged with conspiracy to violate the neutrality laws of the United States, and died there Jan. 13, 1916.

Huet (ü-ā), Pierre Daniel, a French critic and classical scholar, was born at Caen, Normandy, in 1630; died in 1721.

Huggins (hug'inz), Sir William, an eminent English astronomer, born in London in 1824. He gained distinction by his discoveries with the spectroscope on the sun and stars. He was president of the Royal Astronomical Society 1876-78, and of the British Association 1891-92. He died May 14, 1910.

Hugh Capet. See *Capet*.

Hughes (hūz), Charles Evans, governor and supreme court justice, was born at Glens Falls, New York, in 1862. He was graduated from Brown University and Columbia Law School, was professor of law at Cornell University 1891-93, lecturer 1893-95, and at New York Law School after 1893. In 1905 he became counsel on the Armstrong investigations of life insurance companies, and developed very serious evils in the conduct of these institutions. His excellent work in this investigation led to his election as governor of New York in 1906, and again in 1908. Appointed a justice of the U. S. Supreme Court in 1910, he was made the Republican candidate for President in 1916, but defeated.

Hughes, John, archbishop, was born in County Tyrone, Ireland, in 1798. He came to the United States in 1817 and was ordained priest in 1826. In 1838 he became coadjutor bishop of New York, bishop in 1847, and its first archbishop in 1850. In 1861 he was entrusted by President Lincoln with a special mission to France in behalf of the Union cause. He was the founder of St. John's College, Fordham, and of St. Patrick's Cathedral. He died in 1864.

Hughes, Sir Sam (1853-), a Canadian army officer born at Darlington, Ont., son of John Hughes, of Tyrone, Ireland, and Caroline Laughlin, of Scotch-Irish-Huguenot descent, educated at Toronto Model and Normal schools and Toronto University. He was lecturer in English in Toronto Collegiate Institute until 1885, when he purchased the Lindsay *Warder*, which he edited until 1897, and was in the Active Militia from his thirteenth year; in 1897 he became lieutenant-colonel in command of the 45th battalion. He visited Australia and New Zealand in 1897-98 in the interest of Colonial assistance in imperial wars; served in the Boer war, 1899-1900, being mentioned in dispatches several times; served in the European war in France, 1914-15, built the cantonment at Valcartier (see *Canada*), and as Minister of Militia raised contingents for the European war, 1914-18. It was he who sought and obtained for Canada huge orders for munitions from Great Britain and thereby made it possible for Canada to weather the financial depression, pay her own war expenses and emerge from the war in better financial shape than she was when the war broke out. He became colonel in 1902 and was promoted to major-general in 1914.

Hughes, Thomas, an English barrister, author and philosopher, born at Uffington, Berkshire, in 1823. He was educated at Rugby under Dr. Arnold, and afterwards at Oxford. In 1848 he was called to the bar, and in 1869 became a queen's counsel. He is widely known by his popular novel, *Tom Brown's School-days*, a picture of school life at Rugby, published in 1856. *Tom Brown at Oxford* followed in 1861. He died in 1896.

Hugli, a city and river port of Bengal, British India. The chief industries are jute bags and oil.

Hugli, or **Hooghly** (hōg'lĭ), an arm of the Ganges, at the Delta.

Hugo (ū-gō), **Victor Marie,** a French poet and novelist, born in 1802, at Besançon, where his father, then Major Hugo, was stationed in command of a brigade. His father having entered the service of Joseph Bonaparte, king of Italy, and afterwards of Spain, Victor's earlier years were partly spent in those countries, but in 1812 he went with his

Victor Hugo

mother to Paris. At the age of twelve he was already writing verses, and in 1823 his first novel, *Han d'Islande*, appeared, followed in 1825 by *Bug Jargal*. In 1828 a complete edition of his *Odes et Ballades* appeared. In these productions Hugo's anticlassical tendencies in style and treatment of his subject had been very visible, but the appearance of his drama *Cromwell* (1827), with its celebrated preface, gave the watchword to the anticlassical or romantic school. *Cromwell* was too long for representation, and it was only in 1830 that *Hernani*, over which the great contest between Classicists and Romanticists took place, was brought on the stage. Other dramas followed:—*Marion Delorme* (1831), *Le Roi s'amuse* (1832), *Lucrèce Borgia* (1833), *Marie Tudor* (1833), *Angelo* (1835), *Ruy Blas* (1838), *Les Bourgraves* (1843). During those years he had also published a novel, *Nôtre Dame de Paris* (1830), and several volumes of poetry, *Les Feuilles d'Automne* (1831), *Les Chants du Crépuscule* (1835), *Les Voix Intérieures* (1837), *Les Rayons et Les Ombres* (1840). His poetry of this period has a melody of grace superior perhaps to any that he afterwards wrote, but wants that deep and original sense of life which is characteristic of his later poems. During the same period he also wrote his critical essays on Mirabeau, Voltaire, and a number of articles for the *Revue de Paris*. In 1841, after having been twice previously rejected, he was elected a member of the French Academy; made shortly afterwards a tour in the Rhineland, of which he wrote a brilliant and interesting account in *Le Rhin*, published in 1842. In 1845 he was made a peer of France by Louis Philippe. The revolution of 1848 threw Hugo into the thick of the political struggle. At first his votes were decidedly Conservative, but afterwards, whether from suspicion of Napoleon's designs or from other reasons, he became one of the chiefs of the democratic party. After the *coup d'état*, December 2, 1851, he was one of those who kept up the struggle in the streets against Napoleon to the last. He then fled to Brussels, where he published the first of his bitter satires on the founder of the Second Empire, *Napoléon le Petit*. In the following year (1853) the second, the famous volume of *Les Châtiments*, a wonderful mixture of satirical invective, lyrical passion and pathos appeared. Hugo now went to live in Jersey, was expelled along with the other French exiles in 1855 by the English government, and finally settled in Guernsey. It was in the comparative solitude and quietness of the Channel Islands that he wrote most of the great works of his later years, *Les Contemplations* (1856), *La Légende des Siècles*, 1st series (1859), *Chansons des Rues et des Bois* (1865), and his celebrated series of social novels, *Les Misérables* (1862), *Les Travailleurs de la Mer* (1866), and *L'Homme qui Rit* (1869). In 1870, after the fall of the Empire, Victor Hugo returned to Paris, where he spent the remaining years of a remarkably vigorous old age in occasional attendances at the senate, and in adding to the already long list of his literary works. Among these latest productions we may mention *Quatre-vingt-treize* (1872), *L'Art d'être Grand-père* (1877), *L'Histoire d'un Crime* (1877), *Le Pape* (1878), *La Pitié Suprême* (1879), *Religions et Religion* (1880), *Les Quatre Vents de l'Esprit* (1881), *La Légende des Siècles* (last series 1883), *Torquemada* (1882). He died in 1885.

Huguenots (hū'ge-nots), a term of unknown origin, applied by the Roman Catholics to the Protestants of France during the religious struggles of the sixteenth and seventeenth centu-

ries. During the early part of the sixteenth century the doctrines of Calvin, notwithstanding the opposition of Francis I, spread widely in France. Under his successor, Henry II, 1547-59, the Protestant party grew strong, and under Francis II became a political force headed by the Bourbon family, especially the King of Navarre and the Prince of Condé. At the head of the Catholic party stood the Guises, and through their influence with the weak, young king, a very long conflict with the Huguenots commenced. The result was that a Huguenot conspiracy, headed by Prince Louis of Condé, was formed for the purpose of compelling the king to dismiss the Guises and accept the Prince of Condé as regent of the realm. But the plot was betrayed, and many of the Huguenots were executed or imprisoned. In 1560 Francis died, and during the minority of the next king, Charles IX, it was the policy of the queen mother, Catharine de Medici, to encourage the Protestants in the free exercise of their religion in order to curb the Guises. But in 1562 an attack on a Protestant meeting made by the followers of the Duke of Guise gave rise to a series of religious wars which desolated France almost to the end of the century. Catharine, however, began to fear that Protestantism might become a permanent power in the country, and, making an alliance with the Guises, she suddenly projected and carried out the massacre of St. Bartholomew's (August 24, 1572). The Protestants fled to their fortified towns and carried on a war with varying success. On the death of Charles IX, Henry III, a feeble sovereign, found himself compelled to unite with the King of Navarre, head of the house of Bourbon and heir-apparent of the French crown, against the ambitious Guises, who openly aimed at the throne, and had excited the people against him to such a degree that he was on the point of losing the crown. After the assassination of Henry III, the King of Navarre was obliged to maintain a severe struggle for the vacant throne; and not until he had, by the advice of Sully, embraced the Catholic religion (1593), did he enjoy quiet possession of the kingdom as Henry IV. Five years afterwards he secured to the Huguenots their civil rights by the Edict of Nantes, which confirmed to them the free exercise of their religion, and gave them equal claims with the Catholics to all offices and dignities. They were also left in possession of the fortresses which had been ceded to them for their security. This edict afforded them the means of forming a kind of republic within the kingdom, which Richelieu, who regarded it as a serious obstacle to the growth of the royal power, resolved to crush. The war raged from 1624 to 1629, when Rochelle, after an obstinate defense, fell before the royal troops; the Huguenots had to surrender all their strongholds, although they were still allowed freedom of conscience under the ministries of Richelieu and Mazarin. But when Louis XIV and Madame de Maintenon set the fashion of devoutness, a new persecution of the Protestants commenced. They were deprived of their civil rights, and bodies of dragoons were sent to the southern provinces to compel the Protestant inhabitants to abjure their faith. The Edict of Nantes was revoked in 1685, and by this act more than 500,000 Protestant subjects were driven out, to carry their industry, wealth, and skill to other countries. In the reign of Louis XV a new edict was issued repressive of Protestantism, but so many voices were raised in favor of toleration that it had to be revoked. Louis XVI, in 1787, first put the Protestants on an equality with the Catholics.

Huia-bird (hwē'a-berd), the native name of a genus of New Zealand starlings, *Heterolocha acutirostris* or *Neomorpha Gouldii*, comprising a single species of birds, occupying a very limited space in a few densely-wooded mountain ranges. The plumage is a very dark green, appearing to be black in some lights, the tip of the tail white. The most striking peculiarity about this bird is that the male has a stout, straight beak; the female a long, slender, curved bill.

Hulk, the name applied to old ships laid by as unfit for further sea-going service, and used as depots for coals, sailors, etc.

Hull, Isaac, naval officer, born at Derby, Connecticut, in 1775; died in 1843. He became a naval officer in the United States service. In July, 1812, he escaped by skilful sailing with the frigate *Constitution* from a three days' chase by a British squadron, and on August 19 met and sunk the British frigate *Guerriere*, after half an hour's fight, with very little loss to his ship or men.

Hull, William, military officer, was born in Derby, Connecticut, in 1753; was governor of Michigan Territory 1801-14, and in 1812 commanded the Northwest army and surrendered Detroit to General Brock without firing a shot. He was court-martialed and sentenced to be shot, but was pardoned on account of his services in the Revolution. He died in 1825.

Hull, a city, capital of Ottawa county, Quebec, Canada, on the Ottawa River, opposite Ottawa city. It has pulp, paper, lumber and other mills, and in the vicinity are iron, phosphate and mica mines. Pop. (1913) 22,000.

Hull, or KINGSTON-ON-HULL, a river port of England, and a county of itself, locally situated in the East Riding of York at the influx of the Hull into the estuary of the Humber. The town stands on a low and level tract of ground, and stretches along the banks of the Humber, from the inundations of which it is secured by strong embankments. Among the notable public buildings and institutions are the town hall, the new exchange, the corn exchange, dock offices, etc., the royal institution, the public rooms, Hull and East Riding College, Reckitt free library, the infirmary, dispensary, children's hospital, etc. There are three well-laid-out public parks. The industries of the town are varied, comprising flax and cotton mills, shipbuilding, rope and sail works, iron foundries, machine-making, seed-crushing, color-making, oil-boiling, etc.; but its importance arises chiefly from its shipping commerce, Hull being one of the busiest seaports in the kingdom. The docks are among the largest in the kingdom. The railway communications are excellent, not fewer than five railway companies running into the town. It is an ancient town, and was of some importance long before it received its charter from Edward I. It played a conspicuous part during the civil war, being held by the parliamentary forces, and twice besieged without success. Pop. (1911) 278,024.

Hullah (hul'la) JOHN PYKE, an English musician, born in 1813; died in 1884. He entered the Royal Academy of Music in 1832, and attracted some attention by his comic opera, *The Village Coquettes* (1836), which was followed by the *Barber of Bassora* in 1837, and *The Outpost* in 1838. About this time he began to work for the establishment of popular singing schools. He became professor of music at King's College and other institutions in London, and in 1874 inspector of training schools. He wrote some educational and historical works on music, among which are the *Grammar of Harmony*, *Grammar of Counterpoint*, *A History of Modern Music*, etc.

Humanists (hū'man-ists), a party which, during the Renaissance of the sixteenth century, cultivated literature, especially classical literature. Their influence was decidedly in favor of progress and reform, and in this way they may be considered as heralding and coöperating with the great religious reformers. Erasmus is the great type of the humanist, as Luther is of the religious reformer.

Humanitarians (hū-man-i-tā'ri-a n s), a term sometimes applied to the various classes of anti-Trinitarians, who regard Christ as a mere man. Their opinions must not be confounded with Arianism, which admits the preëxistence of Christ, and his preëminence among God's creatures. The term is also applied to the followers of St. Simon, who maintained the perfectibility of human nature without the aid of supernatural grace.

Humanities (hū-man'i-tēz; Latin, *litera humaniores*), a term for humble or polite literature, including the study of the ancient classics, in opposition to philosophy and science. In the Scotch universities *humanity* is applied to the study of the Latin language and literature alone.

Humber (hum'bėr), a large river, or rather estuary, on the east side of England, between the counties of York and Lincoln. At its western extremity it is joined by the Ouse, after the latter has been augmented by the Derwent and Aire; below Goole it receives the Don, lower down the Trent, and still lower the Hull from the opposite side. It is about 35 miles long, and varies in breadth from 1 to 7 miles. There is at all times a considerable depth of water in the fair way of the channel, and the navigation is safe and easy.

Humbert I (in Italian, UMBERTO), King of Italy, was born March 14, 1844, eldest son of Victor Emmanuel. In the war of 1866, in which Italy joined Prussia against Austria, he took the field in command of a division, and distinguished himself by his bravery in the disastrous battle of Custozza. In 1868 he married his cousin, Margherita, daughter of Duke Ferdinand of Genoa. He succeeded his father on January 9, 1878. He was assassinated by a pistol shot, July 29, 1900, by Gaetang Bresci, an Italian anarchist, and was succeeded by his son, Victor Emmanuel III.

Humboldt (hum'bolt), FRIEDRICH HEINRICH ALEXANDER, BARON VON, a German traveler and naturalist, was born in 1769, at Berlin, where his father held the post of royal chamberlain. He studied at the universities of Frankfort-on-the-Oder, Berlin and Göttingen, and also at the commercial academy in Hamburg. His first work was *Observations on the Basalt of the Rhine* (1790). In 1791 he studied min-

ing and botany at the mining school in Freiberg, and subsequently became overseer of the mines in Franconia. In 1797 he resolved to make a scientific journey in the tropical zones along with a friend, Aimé Bonpland. They landed at Cumana, in South America, in July, 1799, and spent five years in exploring scientifically the region of the Orinoco and the upper part of the Rio Negro, the district between Quito and Lima, the city of Mexico and the surrounding country, and the island of Cuba. In 1804 they arrived at Bordeaux, bringing with them an immense mass of fresh knowledge in geography, geology, climatology, meteorology, botany, zoölogy, and every branch of natural science, as well as in ethnology and political statistics. Humboldt selected Paris as his residence, no other city offering so many aids to scientific study, and remained there arranging his collections and manuscripts till March, 1805, after which he visited Rome and Naples in company with Gay-Lussac, but eventually returned to Paris in 1807, when the first volume of his great work, *Voyage aux Régions équinoxiales du Nouveau Continent*, appeared; the thirtieth and last was published in 1827. In 1827 Humboldt, who had been offered several high posts by the government of Prussia, and had accompanied the king on several journeys as part of his suite, was persuaded to give up his residence at Paris and settle at Berlin, where he combined the study of science with a certain amount of diplomatic work. In 1829, under the patronage of the Czar Nicholas, he made an expedition to Siberia and Central Asia, which resulted in some valuable discoveries, published in his *Asie Centrale*. In 1835 he published at Paris his *Examen Critique de la Géographie du Nouveau Continent*. In 1845 appeared the first volume of the *Cosmos*, his chief work, a vast and comprehensive survey of natural phenomena, in which the idea of the unity of the forces which move below the variety of nature is thoroughly grasped. Humboldt died in 1859.

Humboldt, KARL WILHELM, BARON VON, brother of the preceding, was born at Potsdam in 1767, and studied at Berlin, at Frankfort-on-the-Oder, and at Göttingen. After traveling in France and Spain, and acting as Prussian minister at Rome, he was called to fill the office of minister of the interior in connection with ecclesiastical and educational matters, and had a most important share in the educational progress which Prussia has since made. In 1810 he became minister plenipotentiary to Vienna, took an active part in the conclusion of the Peace of Paris (1814), and at the Congress of Vienna (1815), and other great diplomatic transactions. In 1819 he was an active member of the Prussian ministry, but resigned and retired to his estate at Tegel, where he died in 1835. His works include poems, literary essays, etc., but by far the most valuable are his philological writings, such as *Additions and Corrections* to Adelung's *Mithridates; Researches Regarding the Original Inhabitants of Spain in Connection with the Basque Language;* on the *Kawi Language of Java;* on the *Diversity of Language and its Influence on the Development of Speech;* etc.

Hume (hūm), DAVID, an eminent historian and philosopher, was born at Edinburgh in 1711. He was

David Hume

destined for the law but took up literature and retired to France where he composed his *Treatise upon Human Nature*. The work was published at London in 1738, but in his own words, 'fell dead-born of the press.' His next work, *Essays, Moral, Political and Literary* (Edinburgh, 1742), met with a better reception. In 1745 he became companion to the insane Marquis of Annandale; and he accompanied General Sinclair in 1746 and 1747 in his expedition against France and in a military embassy to Vienna and Turin. He now published a recasting of his *Treatise upon Human Nature*, under the title of an *Inquiry Concerning the Human Understanding* (1747). In 1752 he published his *Political Discourses*, which were well received.

and his *Inquiry Concerning the Principles of Morals*. The same year he obtained the appointment of librarian of the Advocates' Library at Edinburgh, and began to write his history of England, of which the first volume appeared in 1754. It was, like most of the succeeding volumes, severely attacked both for its religious and political tendencies; but, in spite of adverse criticism, his *History of England*, after its completion in 1761, was recognised as a standard work. Its merits are chiefly clearness and force of narrative and philosophical breadth of view in the judgment of men and events. In 1763 he accepted an invitation from the Earl of Hertford, then proceeding as ambassador to Paris, to accompany him, and was enthusiastically received by Parisian circles in his character of philosopher and historian. After the departure of Lord Hertford in 1766, he remained as *chargé d'affaires*, and returned to England in 1766, bringing with him Rousseau, for whom he procured a pension and a retreat in Derbyshire. But the morbid sensitivity of Rousseau brought about a disagreement which put an end to the friendship. In 1767 he was appointed under-secretary of state, a post which he held till 1769, when he retired to Edinburgh. Here he lived till his death in 1776. As a philosopher, in which quality his reputation is perhaps greatest, Hume's acute sceptical intellect did great service by directing research to the precise character of the fundamental conceptions in which our knowledge and our beliefs are based. His acute negative criticism of these conceptions (*e. g.*, his reduction of the ideas of personal identity, conscience, casuality, to mere effects of association) compelled philosophy either to come to a dead halt or to find, as Kant did, a new and profounder view of the nature of human reason.

Hume, Joseph, politician and economist, born at Montrose, Scotland, in 1777. After studying medicine at Edinburgh he was appointed marine assistant-surgeon in the service of the East India Company. He held several lucrative posts, returned to England in 1808 with a fortune, and entered Parliament in 1812, where for many years he was notable as a financial reformer, and an opponent of monopolies and high taxes. He died in 1855.

Humerus (hū'mėr-us), the long cylindrical bone of the arm, situated between the shoulder and the forearm; also the corresponding bone in the lower animals.

Humidity (hū-mid'i-ti), in meteorology, the amount of moisture in the atmosphere. A given space can only contain one certain amount of water; containing less it will fill up with evaporation, if more by condensation. When it contains all the moisture it is capable of holding, it is said to be saturated. If the air contains one-half of the water necessary to saturate it the relative humidity is 50; 100 being the point of saturation, after which precipitation ensues.

Humming-birds, the name given to a family (Trochilidæ) of minute and beautiful birds, so called from the sound of their wings in flight. The beak is slender, generally long, sometimes straight and sometimes curved; the tongue is long, filiform, bifid at the point, and capable of being protruded to a considerable distance. In size humming-birds vary from that of a wren to that of a bumble-bee. They never light to take food, but feed while on the wing, hovering before a flower, supported by a rapid vibratory movement of the wings which produces the humming noise. ... sects for great propor ... of their food. These beautiful birds are peculiar to America, and almost exclusively tropical. One species, the ruby-throated humming-bird (*Trochilus colubris*), is somewhat common in the north-east of the United States. The only note of the humming-bird is a single chirp, not louder than that of a cricket. It is very fearless and irascible, two males scarcely ever meeting without a contest. Among the more remarkable of these birds is the tufted-necked humming-bird (*Ornismya ornata*) of Guiana and Northern Brazil. In this species the crest, outer tail-feathers and neck-plumes are reddish chestnut, the latter tipped with green, the throat and upper part of the breast are emerald green, the back bronze green. Perhaps four hundred species of humming-birds are now known.

Tufted-necked Humming-bird (*Ornismya ornata*).

Humus (hū'mus), a substance which occurs in vegetable mold, and in liquids containing decomposing vegetable matter. Humus as it exists in the soil is a product of the decay of vegetables. It is a mixture of various carbon

compounds, which slowly undergo combustion with the production of carbon dioxide, water and ammonia, which are again taken up by plants.

Hundred, in England, a division of a shire or county. It was so called, according to some writers, because each hundred found 100 sureties of the king's peace, or 100 able-bodied men of war. Others think it to have been so called because originally composed of 100 families. Hundreds are said to have been first introduced into England by Alfred. Formerly if a crime was committed, such as robbery, arson, killing or maiming cattle, destroying turnpikes or works on navigable rivers, the hundred had to make it good; but hundreds are now only liable for damage done by rioters acting feloniously.

Hungary (hun'gā-ri; Hungarian name, *Magyar-Ország*, Land of the Magyars), formerly a kingdom, s. e. of Austria, in Austro-Hungarian monarchy. It includes Hungary proper, with Transylvania, Slavonia, Croatia, the Croato-Slavonian Military Frontiers, etc.; total area, 125,039 sq. miles, with a pop. of 19,254,559. Hungary Proper (including Transylvania), area, 108,258 sq. miles, and a pop. of 16,721,574, may be considered as a large basin surrounded by mountains on every side except the south. Of these the principal are the Carpathians, which cover the northern and eastern parts of the country with their ramifications. The Danube and the Theiss, with their affluents, are the chief rivers. The Poprad, in the north, is tributary to the Vistula, being the only Hungarian river not belonging to the basin of the Danube. The Drave forms the southwest frontier on the side of Croatia and Slavonia. Between the Danube and the Drave lie the two principal lakes, the Platten See or Balaton Lake and the Neusiedler See, from which the water occasionally disappears. Hungary is one of the healthiest countries in Europe, and generally has a fertile soil. All kinds of grain, especially excellent wheat, wines, fruits, tobacco, hemp, flax, hops, saffron, woad, madder, sumach and cotton, are among the products of Hungary. Horses, cattle, sheep, hogs, game (in the north bears), poultry, fish, (especially the sturgeon and salmon), bees and silkworms are among the productions of the animal kingdom. Among the minerals are gold, silver, copper, iron, lead, zinc, cobalt, antimony, sulphur, arsenic, salt, etc., with coal and peat. The situation of Hungary, which occupies an area where the various races of Europe meet and interlace, accounts for the variety of nationalities it contains. These comprise, besides the Hungarians or Magyars (over 6,000,000 in number), Roumanians, Slovacks, Germans, Servians, Ruthenians, etc. The Magyars, who are the dominant race, are located for the most part compactly in the center of the kingdom. They are brave, high-spirited and sincere, in many respects resembling their kinsmen the Turks. A decided majority are Roman Catholics, the rest Protestants, chiefly Calvinists, with a few Greek Catholics. The Germans have settled all over the country, and there is scarcely a town of Hungary which is not at least partly inhabited by Germans, while some are essentially German. Science, literature, the press, trade and industry, are for the greater part in their hands. The Hungarian has a natural inclination to agriculture and the breeding of cattle, and the fertility of the soil making up for some deficiencies in methods has made Hungary one of the chief grain-growing countries of Europe. The Hungarian flour is of very fine quality, and is exported to a large value, while there are also extensive wheat exports. Hungary is also celebrated for its wines, the finest variety of which is the Tokay. There are few extensive manufactures. Iron and steel works, potteries, glass manufactories, sugar-refineries, soap and tallow works, are among the principal. The production of coal and iron is increasing and the annual value of the mining products is about $20,000,000. With regard to popular education Hungary is behind the Austrian part of the empire, but education was made compulsory in 1868. There are universities at Budapest, Klausenburg and Agram. The Hungarian language is nearly allied to the Turkish and Finnish, but not to any other tongue spoken in Europe. It has of late been carefully cultivated, and Hungarians have distinguished themselves in all branches of literature. Among modern names we can only mention those of Andrew Horváth, Eötvös, A. and C. Kisfaludy, Garay, Vörösmarty, Petöfi, Kerény, Arany, Josika and Jokay. Besides its representation in the controlling body of Delegations (see *Austria*) Hungary since 1867 has had an independent Diet, consisting of an Upper and Lower House, the first composed of hereditary and life peers, church dignitaries and state dignitaries; the second of representatives elected by vote. The Austrian emperor was also king of Hungary. Croatia and Slavonia (now in Jugo-Slavia) had a common diet of their own for the management of internal affairs.

History.—The Magyars, an Asiatic peo-

ple of Turanian race, allied to the Finns and the Turks, dwelt in what is now Southern Russia before they descended under Arpád into the plain of the Danube, towards the end of the ninth century, and conquered the whole of Hungary and Transylvania. During the first half of the tenth century their invasions and incursions spread terror throughout Germany, France and Italy, but at length their total defeat by Otho I of Germany put an end to their maraudings, and under their native dynasty of Arpáds they settled down to learn agriculture and the arts of peace. Stephen I (907-1030) was the first who was successful in extending Christianity generally amongst the Hungarians, and was rewarded by a crown from Pope Sylvester II and with the title of *apostolic king* (1000). Stephen encouraged learning and literature, and under him Latin became not only the official language of the government, but the vehicle of Hungarian civilization, which it unfortunately continued to be for the next 800 years. In 1089 King Ladislaus extended the boundaries of Hungary by the conquest of Croatia and Slavonia, and King Coloman by that of Dalmatia in 1102. During the twelfth century the Hungarians first attained, through French connections, a certain refinement of life and manners. About the middle of the thirteenth century King Bela induced many Germans to settle in the country which had been depopulated by the Mongol invasions. With Andrew III (1290-1301) the male line of the Arpád dynasty became extinct, and the royal dignity now became purely elective. Charles Robert of Anjou was the first elected (1309). Louis I (1342-82) added Poland, Red Russia, Moldavia and a part of Servia, to his kingdom. The reign of Sigismund (1387-1437), who was elected Emperor of Germany, is interesting from the invasion of Hungary by the Turks (1391), and the war with the Hussites. Sigismund introduced various reforms, and founded an academy at Buda. Matthias Corvinus (1458-90), combining the talents of a diplomatist and general, was equally successful against his enemies at home and abroad, and is even yet remembered by the popular mind as the ideal of a just and firm ruler. He founded a university at Pressburg. During the reigns of Ladislaus II (1490-1516) and Louis II (1516-26) the rapacity of the magnates and domestic troubles brought the power of Hungary low, and the battle of Mohacs (1526) made a great part of the country a Turkish province for 160 years. The rest was left in dispute between Ferdinand of Austria and John Zapolya; but eventually by the help of the Protestants it passed to the former, and has since remained under the sceptre of the Hapsburgs. In 1686 Leopold I took Buda and recovered most of Hungary and Transylvania. In 1724 Charles VI secured by the Pragmatic Sanction the Hungarian crown to the female descendants of the house of Hapsburg, and the loyalty of the Hungarians to his daughter, Maria Theresa, saved the dynasty from ruin. Maria Theresa did much for the improvement of Hungary by the promulgation of the rural code called Urbarium, and by the formation of village schools. On the advent of the French revolution, and during the wars which ensued, the Hungarians once more played a prominent part in support of the Hapsburg crown. Napoleon fell, but the revolution had given an impetus to ideas of national and popular rights which the Hungarians, long stifled under the Germanic traditions and tendencies of their rulers, were amongst the first to feel. For a time Francis I and Metternich stood stiffly out against all concessions, and tried to govern by pure absolutism, but ended by summoning in 1825 a new diet. The diet distinguished itself by adopting the Magyar language in its debates, instead of the Latin to which it had been accustomed. Succeeding diets in 1830 and 1832 made new demands in the direction of religious equality, a popular suffrage, and abrogation of the privileges of the nobles. The Austrian government attempted to repress the Hungarian national movement by imprisoning Deák, Kossuth, and others of the leaders. The struggle continued till 1848, when the French revolution of that year gave the impulse for a similar rising in Vienna. Prince Metternich fled to London, and the Viennese court made a formal concession of all important demands but these had no sooner been granted than the government began secretly to work against their being put in operation. The dependencies of the Hungarian crown, the Croats and the Wallachians of Transylvania were privately encouraged to revolt, and in December of the same year an Austrian army took the field with the avowed object of annihilating the independence of Hungary; but a series of pitched battles resulted on the whole so much in favor of the Hungarians that Austria was obliged to call in the aid of Russia, which was at once granted. After a heroic struggle the Hungarians had to succumb. The nation was reduced to the position of a province, and some of the greatest statesmen and soldiers of Hun-

gary perished on the scaffold. But the struggle was continued by the Hungarians in the form of a constitutional agitation, and at last, when the battle of Sadowa in 1866 separated Austria from Germany, Austria, left face to face with a nation almost as powerful and numerous as itself, felt compelled to submit. In 1867 a separate constitution and administration for Hungary was decreed, and on June 8th the emperor and empress were crowned king and queen of Hungary with the utmost pomp, according to the ancient ceremonies of a Hungarian coronation. The dualism of the Austrian empire was thus finally constituted. The defeat of the Central Powers in the European war (q. v.), 1914-18, resulted in the dissolution of the dual empire, and Hungary became an independent state, much reduced in size. Croatia and Slavonia, which had been included in the Hungarian kingdom, were incorporated in the Serb-Croat-Slovene state, Jugo-Slavia; Transylvania was given to Roumania; a large strip of territory in the north became part of Czecho-Slovakia, and a smaller strip in the northeast was incorporated in the reconstructed state of Poland. (See map of Austria-Hungary.) After the peace of 1919 (see *Treaty*), Hungary had an area of about 70,000 acres; pop. about 14,000,000. For a time a Bolshevist government was set up, under Bela Kun, but pressure of the Allies compelled his retirement in Aug., 1919. The Roumanians entered the country and looted it.

Hungary Balsam, a kind of turpentine procured from *Pinus Pumilio*, the mountain-pine of Hungary.

Hungary Water, a distilled water consisting of dilute alcohol aromatized with the tops of flowers of rosemary or other aromatic substances, used as a perfume, so called because first made for the use of a queen of Hungary.

Hunger (hun'gĕr), a craving for food. It is a sensation partly arising in the stomach, since it may be relieved temporarily by the introduction into the stomach of material which is incapable of yielding any nutriment to the body. It may be due to a condition of fullness of the vessels of the stomach relieved by any stimulus which, acting on the lining membrane, induces a flow of fluid from the glands. But it also arises from a condition of the system, since the introduction of nutriment into the blood, apart altogether from the stomach, will relieve it. This is also evident from the fact that hunger may be experienced even when the stomach is full of food, and when food is supplied in abundance, if some disease prevents the absorption of the nourishment, or quickly drains it from the blood. Hunger may be partially allayed by sleep or by the use of narcotics, tobacco and alcohol, all of which tend to diminish the disintegration of tissues.

Hüningen (hü'ning-en), a town of Germany, in Upper Alsace, formerly fortified. It has a famous imperial fish-breeding establishment. Pop. 3304.

Huns, a nomadic and warlike people of Asia, of Mongolian race, part of whom entered Europe, probably in the fourth century after Christ, conquered the Alans, and drove the Goths out of Dacia. They continued to extend their dominion along the Danube till the time of Attila (434 A.D.), who, uniting the whole Hunnish power under one head became the most powerful prince of his time. (See *Attila.*) His defeat near Chalons was the commencement of the decline of the power of the Huns, and within a generation after his death in 453, the great Hunnish empire had completely disappeared, and the race been absorbed amongst other barbarous peoples. The term Huns was used by ancient and mediæval writers in a very vague way to indicate barbarous hordes invading Europe from the northeast. The Huns are described as a race of dark complexion with small black eyes, flat noses and broad shoulders.

Hunt, James Henry Leigh, an English poet and essayist, born at Southgate, near London, in 1784. He was educated at Christchurch Hospital, where he attained some distinction, entered the office of his brother, an attorney, and afterwards obtained a situation in the war office. In 1808, in conjunction with his brother John, he started the *Examiner* newspaper, which soon became prominent for the fearlessness with which public matters were discussed. Ere long official resentment took shape in two prosecutions of the brothers, the second of which, occasioned by an article in the paper of March 22, 1812, reflecting on the character of the prince regent, resulted in the brothers being sentenced to pay a fine of £500 each, and to suffer two years' imprisonment. During his confinement Leigh wrote several works, among which are the *Feast of the Poets*, the *Descent of Liberty* and the *Story of Rimini*. In 1818 appeared *Foliage*, a collection of original poems and translations from Homer, Theocritus, Bion, etc., and in 1819 the *Indicator* was started, a weekly journal on the model

of the *Spectator*, which contained some of his best essays. In 1822 he proceeded to Italy, having received an invitation thither from Byron and Shelley, and, in conjunction with the former, carried on a newspaper called the *Liberal*, but it proved unsuccessful. On his return to England Hunt published *Recollections of Lord Byron and some of his Contemporaries* (two vols., 1828), which provoked somewhat the indignation of the noble poet's friends. Among his subsequent works may be mentioned, *A Legend of Florence*, a play represented with some success at Covent Garden in 1840; *Stories from the Italian Poets* (two vols., 1846); *Men, Women and Books* (1847); *A Jar of Honey from Mount Hybla* (1847); *The Town, its Memorable Characters and Events* (1848); *Autobiography* (three vols., 1850); *Table Talk* (1850). In 1842 Mrs. Shelley settled an annuity of £120 upon Leigh Hunt, and in 1847 a government pension of £200 a year was bestowed on him. He died in 1859.

Hunt, THOMAS STERRY, chemist, born at Norwich, Connecticut, in 1826; died in 1892. He was professor of chemistry at McGill University, 1862-68, and of geology at the Massachusetts Institute of Technology, 1872-78. He contributed many valuable papers to scientific journals, developed an original system in organic chemistry and made important researches into the composition of rocks. In 1859 he invented the green ink with which greenbacks are printed.

Hunt, WILLIAM HOLMAN, an English painter, born in 1827 at London. He was trained in the Royal Academy school, and began to exhibit in 1846. He belongs to the so-called Pre-Raphaelite school of English artists. (See *Pre-Raphaelite School.*) In 1853 his *Claudio and Isabella* first attracted public attention, followed next year by the *Light of the World* (Christ teaching in the temple). Mr. Hunt then made a journey to the East, the fruits of which are observable in the local coloring and strength of realization in his succeeding pictures of Eastern life, among which we may mention *The Scapegoat* (1856); *The Finding of the Saviour in the Temple* (1860); *Shadow of the Cross* (1873); *Plains of Esdraelon* (1877); *Triumph of the Innocents* (1885). Outside of Biblical subjects Mr. Hunt painted some notable pictures: *Isabella and the Pot of Basil*, *The After-Glow*, *The Festival of St. Swithin*, etc. He died in 1910.

Hunter, JOHN, surgeon and physiologist, was born at Long Calderwood, Lanarkshire, in 1728. He assisted his brother-in-law, a carpenter in Glasgow, for some time in his trade, but afterwards went as assistant to his brother William, a prosperous surgeon in London. In 1756 he was appointed house-surgeon at St. George's Hospital, and also lectured in his brother's school of anatomy. In 1760, his health needing a change of climate, he became staff-surgeon and went with the army to Portugal. Three years afterwards he returned to London, and, in 1768, was appointed surgeon to St. George's Hospital; in 1790 surgeon-general to the army, and inspector-general of hospitals. He died in 1793.

Hunter, ROBERT (?-1734), one of the ablest of the English colonial governors in America, born in Scotland. He entered the army, and it was with the rank of colonel he was appointed governor of New York (1710). He returned to England in 1719. Some years later he became governor of Jamaica. He was among the most genial of early American statesman, and his experience with his legislative assembly was for the New York people a valuable training in constitutional self-government.

Hunter, ROBERT MERCER TALIAFERRO (1809-87), an American statesman, born in Essex county, Virginia, educated at the University of Virginia. He studied law, and began practice in 1830. Politics early interested him, and at the age of twenty-four he was elected to the state legislature. Elected to Congress in 1837, he made a name for himself as a forceful advocate of free trade, in opposition to Clay's protective policy. He was speaker of the House of Representatives, and was returned to Congress several times. In 1847 he became United States senator, and served till the outbreak of the Civil war, when he withdrew on the secession of Virginia and became the Confederate secretary of state. After the war he was treasurer of Virginia.

Hunter, WILLIAM, physician and anatomist, elder brother of John Hunter, was born at Long Calderwood, Lanarkshire, in 1718; studied at Glasgow with a view to entering the church, but abandoned theology for medicine. In 1741 he went to London, where he became a member of the College of Surgeons; acquired a large practice in surgery and midwifery; was appointed accoucheur to the British Lying-in Hospital, and in 1764 physician-extraordinary to the queen; in 1767 a fellow of the Royal Society; in 1780 foreign associate of the Royal Medical Society at Paris, etc. In 1770 he established a theater of anatomy for his own lectures and a splendid museum for his anatomical preparations, objects of natural history, pictures

of ancient coins and medals, etc. He was the author of some important works, in particular the *Anatomy of the Human Gravid Uterus*, published in 1774. He died in 1783, bequeathing the whole of his splendid museum, valued at £150,000, to the University of Glasgow, with the sum of £8000 in cash to be expended in a building for its reception, and a further sum of £500 per annum to bear the charges of its preservation.

Hunting. See *Fox-hunting.*

Huntingdon (hunt'ing-dun), HUNTINGDONSHIRE, (contracted to HUNTS), a small inland county of England, 30 miles long by 23 broad; area, 359 sq. miles. It has no hill-ranges of importance, and almost the whole area is arable or in pasture. It is watered chiefly by the Ouse and the Never, which form its northern boundary. The soil has been much improved by scientific farming. The northeastern part is included in the great fen district and is principally devoted to grazing. There were here formerly some large lakes or meres, but they have been drained and made available for cultivation. The soil is principally clay, with sand, gravel and peat-earth in places, the latter in the fen district. There are here many relics of the ancient Roman occupation and two Roman roads traverse the county. There are also interesting mediæval ruins and buildings of historic interest. Pop. 57,583.

Huntingdon, a borough, capital of Huntingdonshire, England, on the N. bank of the Ouse, 17 miles N. W. of Cambridge. It has ancient churches and various manufactures, and was the birthplace of Oliver Cromwell. Pop. 4003.

Huntingdon, a borough, county seat of Huntingdon County, Pennsylvania, on the Juniata River, 34 miles E. of Altoona, in the south-center of the State. It is the seat of Juniata College and a State industrial reformatory, and has manufactures, including boilers and radiators, sewer-pipe, knit goods, etc. Two hydro-electric plants furnish cheap electricity. Pop. 6861.

Huntingdon, SELINA, COUNTESS OF, an English lady, eminent for piety and munificence, daughter of the Earl of Ferrers, was born in 1707, and died in 1791. She was married in 1728 to the Earl of Huntingdon. After his death she joined the Calvinistic Methodists, chose Whitefield for her pastor, and was noted for zeal and devotion. She formed a sect known as the 'Countess of Huntingdon's connection.'

Huntington, a city, capital of Huntington county, Indiana, on the Little River, one mile from the Wabash, with good railroad facilities. It has extensive limestone quarries, and produces lime, cedar chests, machinery, shears, furnaces, rubber specialties, pianos, boots and shoes, etc. Pop. 14,453.

Huntington, a city, capital of Cabell county, West Virginia, on the Ohio River, 15 miles above Ironton, Ohio, and on the Baltimore and Ohio and Chesapeake and Ohio Railroads. Here is Marshall College and a State asylum for incurables. Its manufactures comprise cars and car-wheels, lumber, glass, stoves, cigars, etc. Coal, iron, salt and lumber are shipped. Pop. 31,161.

Huntington, a town in Fairfield Co., Connecticut, 13 miles W. of New Haven. It has saw-mills, distilleries, and manufactures. Pop. 6545.

Huntington, a town of Suffolk Co., N. Y., including Northport village, on Long Island, 32 m. E. N. E. of Brooklyn. It has very extensive brickyards, as well as other manufactures. Pop. 12,004.

Huntington, COLLIS POTTER, American railroad builder, born in 1821 at Harwinton, Connecticut; died 1900. He became associated with Leland Stanford, Mark Hopkins and Charles Crocker in the planning and construction of the Central Pacific Railway (1869) and later the Southern Pacific (1881) and the Chesapeake and Ohio railroads and became the operating head of these systems and others. He gave liberally to educational institutions and left a fortune estimated at from 35 to 80 million dollars.

Huntington, DANIEL, artist, was born in New York city in 1810; died in 1906. In 1862–69 he was president of the National Academy, and again in 1877–91. Among his works are *A Toper Asleep*, *Mercy's Dream*, and portraits of President Lincoln and Louis Agassiz.

Hunyady Janos (hun'ya-di), a famous Hungarian soldier, born in Hunyad, Transylvania, about 1395; died in 1456. His life was devoted to an almost unceasing contest with the Turks, in which he showed striking military ability. His most celebrated exploits were the expulsion of the Turks from Transylvania in 1441, the brilliant campaign south of the Danube in 1442, and the storming of Belgrade in 1456. He was defeated at the battles of Varna and Kossova. He acted as co-regent and governor of the kingdom, 1446–53, and one of his sons succeeded to the crown.

Hura (hū'ra), a genus of tropical American plants, nat. order Euphorbiaceæ. *H. crepitans*, the sand-box tree, is remarkable for the loud report with which its seed-vessels burst. It is a large, branching tree with glossy, poplar-like leaves, inconspicuous diœcious flowers, and large, furrowed, roundish fruits of the size of an orange.

Sand-box Tree (*Hura crepitans*).

Hurdles (hur'dlz), frames formed of perpendicular stakes with horizontal bars, and braced with diagonal pieces for the purpose of forming temporary fences. In fortification the name is given to a collection of twigs or sticks closely interwoven and sustained by long stakes, serving to render works firm, or to cover traverses and lodgments for the defense of workmen against firearms or stones.

Hurdwar. See *Hardwar*.

Hurdy-gurdy (hur'di-gur'di), a very old stringed instrument played by turning a handle. Its tones are produced by the friction of a wheel acting the part of a bow against four strings, two of which are pressed by the fingers or by keys. The other two strings are turned a fifth apart to produce a drone bass, and are not stopped by the fingers or keys.

Hurlbut (hurl'but), STEPHEN AUGUSTUS, an American soldier and politician, born at Charleston, S. C., 1815; died in Peru, 1882. He practiced law and was in the Illinois State Legislature from 1859 to 1861. During the Civil war he was promoted to major general of volunteers and commanded the 16th Army Corps in Sherman's Mississippi campaign of 1864. He was U. S. Minister to Colombia and Peru.

Huron, a city, the capital of Beadle county, South Dakota, 119 miles E. by N. of Pierre. It has a large shipping and supply business and various manufactures. Pop. 5791.

Huron (hū'run), LAKE, one of the five great lakes on the frontiers of the United States and Canada. It is the third in size, being 218 miles long north and south, and (exclusive of Georgian Bay) 105 miles broad at its widest part with an area of about 23,000 sq. miles. It lies 581 feet above sea-level. The lake contains several thousand islands, varying in size from a few square feet to huge islands like the Great Manitoulin, which is about 80 miles long. The waters have a mean depth of 250 and a maximum of 750 feet.

Huronian Rocks, in geology, a term applied to certain Archæan rocks on the banks of Lake Huron, consisting of schists, sandstones, grits, and igneous rocks.

Hurons. See *Wyandots*.

Husband and Wife, a man and woman united by lawful marriage. The personal rights of the husband and the wife are in the United States decidedly limited. The husband has no right of chastisement, as under the common law, although he is still the recognized legal head of the family. By law the domicile of the wife follows that of the husband. His duty is to support the family. The wife's duty is to render household services. The husband is not held liable for crimes and torts committed by his wife, in his presence, unless the tort was committed as agent of the husband, or the crime at his instigation, or with his help, in which case he is guilty as an accomplice. A married woman has all the rights, in respect to property, real and personal, and the acquisition, use, enjoyment, and disposition of it, which she would have if she were unmarried. She can make contracts with any person, including her husband; she may carry on any business, trade, or occupation; she may exercise all powers and enjoy all rights in respect to her property and her contracts, and she is subject to all liabilities which flow from her independent status. All sums which may be recovered in actions or special proceedings by a married woman to recover damages to her person, estate, or character, are her separate property. Judgment for or against a married woman may be rendered and enforced, in a court of record, or not of record, as if she were single. If a husband abandons his wife or children he may be arrested and punished. Magistrates' courts usually have jurisdiction over cases of abandonment and non-support.

Huskisson (hus'kis-un), WILLIAM, an English statesman, born in Worcestershire, in 1770. In 1827 he became Secretary of State for the colonies and was a recognized

authority on all questions of trade and commerce. In 1828 a misunderstanding with the Duke of Wellington, then at the head of the cabinet, led to his withdrawing, along with other Tories, from the administration. He was accidentally killed at the opening of the Liverpool and Manchester Railway, September 15, 1830.

Huso (*Acipenser huso*), the great or white sturgeon. See *Sturgeon*.

Huss, or HUS, JOHN, a Bohemian religious innovator, born about 1373. He studied at the University of Prague, took the degree of Master of Arts in 1396, and in 1398 began to lecture on theology and philosophy. In 1401 he was made dean of the faculty of philosophy, became the leader of the Bohemian in opposition to the German professors and academicians, and after the withdrawal of the latter to Leipsig, was made rector of the university (1409). Since 1391 he had been acquainted with the writings of Wickliffe, and his denunciation of the papal indulgences, of masses for the dead, of auricular confession, etc., alarmed Archbishop Sbynko of Prague, who had 200 volumes of Wickliffe's writings burned (1410) in the archiepiscopal palace, and the preaching in Bohemian prohibited. Huss appealed to the pope, John XXIII, who summoned him to appear at Rome. Huss refused to appear, and was in consequence excommunicated, and Prague laid under an interdict as long as Huss should remain in it. The people of Prague, however, stood by their preacher, and the pope was compelled to acquiesce. But the quarrel broke out again when Huss and his friend Jerome publicly condemned the papal indulgences granted for the crusade against Ladislaus of Naples. Huss was again excommunicated and Prague interdicted. The reformer now retired to Hussinatz to the protection of his feudal lord, and here he wrote his books *On the Six Errors* and *On the Church*, in which he attacks transubstantiation, the belief in the pope and the saints, the efficacy of the absolution of a vicious priest, unconditional obedience to earthly rulers, and simony, which was then extremely prevalent, and makes the Scriptures the only rule of matters of religion. The approbation with which these doctrines were received, both among the nobility and common people, increased the party of Huss in a great degree, and emboldened him to comply with the summons of the Council of Constance to defend his opinions before it. The Emperor Sigismund, by letters of safe conduct, became responsible for his personal safety; and John XXIII, after his arrival at Constance, November 4, made promises to the same effect. Notwithstanding this, he was thrown into prison, November 28, and after several public examinations, conducted with a view to making him retract opinions deemed heretical, he was sentenced to death on July 6, 1415, and burned alive the same day, and his ashes thrown into the Rhine. See also *Hussites*.

Hussar (hö-zär'), originally the name of the Hungarian cavalry, raised by Matthias I in 1458. Every twenty houses were obliged to furnish a man, and thus from the Hungarian word *huss* (twenty) was formed the name *Huszar*, *Hussar*, afterwards applied generally to light cavalry, similarly dressed and armed, of other European armies.

Hussites (hus'its), the followers of John Huss. After the death of Huss, his adherents took up arms for the defense of their principles, and under the leadership of Johann Ziska, captured Prague, fortified Mount Tabor, and repeatedly defeated the troops sent against them by the Emperor Sigismund, who had succeeded to the crown of Bohemia. Ziska died in 1424, and was succeeded by Procopius, who also distinguished himself by many victories. The excesses of this party, however, who were called the *Taborites*, alienated the moderate Hussites, who called themselves *Calixtines*, and who finally united with the Catholics by the Compact of Prague in 1433 to acknowledge Sigismund as king; certain concessions, especially the use of the cup for the laity, having been made to them by the Council of Basel. The Taborites, thus weakened, were totally defeated at Bömischbrod on 31st May, 1434, and afterwards declined as a political party, finally becoming merged in the Bohemian Brethren. See *Bohemia*, *Bohemian Brethren*.

Hustings (hus'tingz), (1) a name given to a court formerly held in many cities of England, as York, Winchester, Lincoln, but especially applied to the county court of the city of London held before the lord-mayor, recorder and sheriffs. (2) The platform from which candidates for seats in Parliament addressed the constituency on their nomination previous to the Ballot Act of 1872.

Husum (hö'sum), a seaport of Prussia in Schleswig-Holstein, with a good trade. Pop. 8268.

Hutcheson (huch'e-sun), FRANCIS, philosophical writer, born in Ireland in 1694. He studied at the University of Glasgow from 1710 to 1716, was licensed to preach, but se-

up a private academy in Dublin. In 1725 his celebrated *Inquiry into the Ideas of Beauty and Virtue* appeared, followed in 1728 by his *Treatise on the Passions*. In 1729 he was called to the chair of moral philosophy at Glasgow. The main features of his philosophical teachings are the theory of a distinct moral sense or conscience peculiar to man, and his view of virtue as benevolence. Hutcheson's moral philosophy is strongly opposed to the empiricism of Locke, and in this respect he may be considered as the precursor of Reid and the Scottish school of philosophy. In 1755 a *System of Moral Philosophy* was published from his MSS.

Hutchinson, ANNE (1590–1643), noted religious enthusiast, daughter of a clergyman of Lincolnshire, England, was born in 1590; married William Hutchinson, and in 1634 emigrated to Boston. She held meetings, lectured, and denounced the Massachusetts clergy as being with few exceptions 'under the covenant of works, not of grace.' Her followers were charged with Antinomianism and she was banished from the colony. She and her friends acquired territory from the Narragansett Indians of Rhode I., where they set up a community on the principle that no one was to be 'accounted a delinquent for doctrine.' After the death of her husband (who shared her opinions) she removed to a new settlement near Stamford, Conn., and in 1643 she and her whole family of fifteen persons (one daughter excepted) were massacred by Indians.

Hutchinson, a city, county seat of Reno County, Kansas; located near center of the state on the Arkansas River, on main lines of Santa Fé, Rock Island, and Missouri Pacific railroads. The industries include extensive salt manufacture, soda ash and strawboard plants, flouring mills, packing house, etc. Pop. 20,000.

Hutten (fon hö'ten), ULRICH VON, a German knight, distinguished for the influence which his writings exercised upon the Reformation, was born at the family castle of Steckelberg on the Main, in 1488, and educated at the famous monastic school of Fulda. He led a wandering and unsettled life, sometimes appearing as the man of letters and controversialist, at other times as the soldier. His first attacks on the Roman Church were in connection with his defence of the persecuted Reuchlin, and with the issuing of the *Epistolæ Obscurorum Virorum* (which see). In 1517 he was crowned laureate at Augsburg, and knighted by the emperor. A year or two after he retired to his fraternal castle to write work after work, addressing the people, like Luther, in their native German, and denouncing the arrogance and corruption of Rome. The Roman authorities at length began to move against him, and he fled to the castle of his friend Franz von Sickingen, and from that again to Switzerland, where he died in 1523.

Hutton (hut'ton), CHARLES, an English mathematician, born at Newcastle-upon-Tyne, in 1737. He was first a teacher of mathematics at Newcastle, but having published in 1772 a small work on the *Principles of Bridges*, which attracted attention, he was next year appointed professor of mathematics at Woolwich College. In 1785 he published his *Mathematical Tables*, followed not long after by his *Tracts, Mathematical and Philosophical* and *Elements of Conic Sections*. His *Mathematical and Philosophical Dictionary* appeared in 1795-96; his *Course of Mathematics* in 1798, with an additional volume in 1811. In 1812 he published another collection of *Tracts* on mathematical and philosophical subjects. He died in 1823.

Hutton, JAMES, a Scottish geologist, born at Edinburgh in 1726. He studied at the university there and at Leyden, where he was graduated as M.D. in 1749. Returning to Scotland, he settled for a time on a farm of his own in Berwickshire, but about 1768 went to Edinburgh, and devoted himself to scientific researches. His name is especially connected with a geological system, the chief features of which are his recognition of the similarity of processes in the past and present, and his theory of igneous fusion as accounting for most geological phenomena. Among his numerous works are an *Investigation of the Principles of Knowledge*, a *Theory of Rain* and a *Theory of the Earth, with Proofs and Illustrations* (1795). He died in 1797.

Huxley (huks'li), THOMAS HENRY, an English naturalist, born at Ealing, Middlesex, in 1825. He was graduated M.B. at the University of London in 1845, and entered the royal navy as assistant surgeon in 1846. Sailing in the *Rattlesnake* on a surveying expedition to Australia, he sent a number of valuable papers to the Royal Society. He held numerous educational and other positions, was president of the British Association in 1870, was elected lord-rector of Aberdeen University in 1872, was secretary of the Royal Society, and a member of various royal commissions, etc., resigning nearly all his positions in 1885 on account of ill health. He was made a member of the privy council in 1892. Among his

works are *The Oceanic Hydrozoa* (1857), *On the Theory of the Vertebrate Skull*, *Man's Place in Nature* (1863), *Elements of Comparative Anatomy* (1864), *Elementary Physiology* (1866), *Lay Sermons, Addresses and Reviews* (1870), *Physiography* (1877), *Anatomy of Invertebrate Animals* (1877), *The Crayfish* (1879), *Science and Culture* (1882). He was a very popular lecturer, and stood in the foremost rank among biologists, strongly sustaining the Darwinian theory. In 1876 he visited America, delivering a series of lectures on fossil horses; his first address was at Johns Hopkins University. He died in 1895.

Huy (wē), a fortified town of Belgium, province of and 18 miles southwest of Liège and 19 miles east of Namur. It is situated on the Meuse, which is crossed here by an important bridge. It was the scene of a desperate battle in August, 1914, at the opening of the European war. The German troops after demolishing the forts at Liège advanced on Huy, but the Belgians met them with a stout resistance, which was only overcome after a prolonged engagement, the invaders suffering heavy casualties. The town was occupied August 16 by the Germans. In the many wars that have swept over this region Huy has suffered again and again. It was captured by the Dutch and then by the French, and changed hands repeatedly. Records of the town date back to the 7th century, and some authorities assert that it was founded by the emperor Antonius in 148 A. D. The population in 1904 was 14,164; in 1910 it had grown to 14,545.

Huygens (hoi'gens), CHRISTIAN, a Dutch mathematician and physicist, born in 1629. He studied at Leyden and at Breda, where he went through a course of civil law from 1646-48. He made several journeys to Denmark, France and England; in 1666 settled at the invitation of Colbert in Paris, where he remained till 1681, when he returned to Holland on account of his health. He died at The Hague in 1695. Among his most important contributions to science are his investigations on the oscillations of the pendulum, and his *System of Saturn*, in which he first proved that the ring completely surrounds the planet, and determined the inclination of its plane to that of the ecliptic. In 1690 he published important treatises on light and on weight. His *Traité de la Lumière* was founded on the undulation theory, but in consequence of the prevalence of the Newtonian theory it was long neglected till later researches established its credit.

Huysum (hoi'sum), JAN VAN, a distinguished Dutch flower and fruit painter, born at Amsterdam in 1682. He worked at first with his father Justus Huysum, a picture dealer and painter, but afterwards set up on his own account, devoting himself to the painting of fruit and flowers, in which he reached the highest perfection, surpassing all his predecessors in softness and delicacy of color, fineness of penciling and exquisite finish. He was extremely jealous of rivalry, and kept his methods of working, preparation of colors, etc., a deep secret. He died at Amsterdam in 1749. His brother JUSTUS was a battle painter, and died at the age of twenty-two years. Another brother, JAKOB, copied his brother's flower and fruit pieces so perfectly that they have been mistaken for that master's work. He died in England in 1740.

Hwang-Ho. See *Hoang-Ho*.

Hyacinth (hī'a-sinth), a genus of liliaceous bulbous plants, including about thirty species, among which the garden hyacinth (*Hyacinthus orientālis*) is celebrated for the immense varieties which culture has produced from it. It is a native of the Levant, and was first cultivated as a garden flower by the Dutch about the beginning of the sixteenth century.

Hyacinth, or JACINTH, a variety of the mineral zircon, whose crystals, when distinct, have the form of a four-sided prism, terminated by four rhombic planes, which stand on the lateral edges. Its prevailing color is red, more or less tinged with yellow or brown. The name hyacinth is also given to varieties of the garnet or cinnamon stone, the sapphire, and topaz.

Hyades (hī'a-dēz), a cluster of five stars in the constellation Taurus, supposed by the ancients to indicate the approach of rainy weather when they rose with the sun.

Hyæna. See *Hyena*.

Hya-hya (*Tabernæmontanautilis*), a milky plant of South America. See *Cow-trees*.

Hyalite (hī'a-lit), a pellucid variety of opal, resembling colorless gum or resin.

Hyatt (hī'at), ALPHEUS, scientist, born at Washington, D. C., in 1838; died in 1902. He served with distinction in the civil war, held professorships in leading scientific institutions, and in 1881 became professor of zoölogy and palæontology in the Massachusetts Institute of Technology. He was subse-

quently curator of the Boston Society of Natural History. He wrote *Memoirs on the Polyzoa, Guides for Science Teaching*, etc.

Hyatt, JOHN WESLEY, inventor, was born at Starkey, New York, in 1837. His inventions were chiefly that of celluloid, which became an enormous industry, a solvent for pyroxylin, and a water purifying system.

Hybla (hī'bla), a mountain in Sicily, where thyme and odoriferous flowers of all sorts grow in abundance. It was famous in ancient times for its honey.

Hybrid (hī'brid), the produce of a female animal or plant which has been impregnated by a male of a different allied species or genus. Much uncertainty prevails respecting the productive crossing of species, but it seems to be established that while the crossing of different genera may result in offspring, that of different orders will not. Hybrids are obtained among fishes from different species of carp; among birds, from the goldfinch and canary, the swan and the goose, etc.; among mammals, from the horse and the zebra, the horse and the ass, the produce of the last two being the mule proper; from the lion and tiger, the dog and wolf, the dog and fox, the goat and ibex. Instances of hybrids between animals of different genera have been furnished by the union of the goat and the antelope, and of the stag and the cow. It used formerly to be considered that the propagative power of hybrids was either absolutely null, or that they propagated only with an individual of the pure breed; but the experiments of Dr. Darwin and other recent researches have shown that although infertility to some degree generally attends sexual intercourse between different species, yet in such intercourse every degree of difference from absolute sterility up to complete fertility is found. The results hitherto obtained may be summarized as follows:—The crossing of species of different families is in almost every case infertile; allied species are capable of producing offspring, and this capability is in indefinite ratio to the degree of their likeness; hybrids are frequently fertile with their parents, but more rarely among themselves; there is no fixed relation between the degree of fertility manifested by the parent species when crossed and that which is manifested by their hybrid progeny. In many cases two pure species can be crossed with unusual facility, while the resulting hybrids are remarkably sterile; and, on the other hand, there are species which can only be crossed with extreme difficulty, though the hybrids when produced are very fertile.

Hycsos (hik'sōs), or HYKSHOS, or Shepherd Kings, wandering tribes of Semitic descent, who conquered the whole of Egypt about 2100 B.C., and were driven out some five hundred years afterwards. The only detailed account of them in any ancient writer is a passage of a lost work of Manetho, cited by Josephus. Their epoch covers the thirteenth to the seventeenth dynasties.

Hydaspes (hī'dus-pēz), ancient name of a river of India, the modern Jehlam, or Jhilam.

Hydatid (hī'da-tid), a term applied to a kind of bladder-worm, which is the larval stage of a small tapeworm, the *Tænia echinococcus*, found in the dog and wolf. The hydatid consists of an external sac, which is derived from the tissue of the organ in which it is situated, and which is filled with buds or capsules containing the larvæ of the worm.

Hyde (hīd), a town of England, in Cheshire, about 7 miles E. S. E. of Manchester. The inhabitants are largely employed in cotton manufacture and coal mines. There are also iron foundries and engineering works. Pop. (1911) 33,444.

Hyde, or HIDE, measure of land, frequently mentioned in Domesday-book and in old English charters, and variously estimated as equivalent to 60, 80, and 100 acres—a fact which may be accounted for on the supposition that the quantity was always determined by local usage. It was such a portion of land as might be ploughed with one plough. The hyde at present is reckoned at 100 acres.

Hyde Park, a town of Suffolk county, Massachusetts, 8 miles S. by W. of Boston. It is situated on the Neponset River, has various manufactures and is a place of residence for Boston business men. Pop. (1910) 15,507.

Hyde Park, a London park containing about 400 acres, and having on the west Kensington Gardens. It abounds with fine trees, and is the great fashionable promenade and public lounge of Western London. It contains the Rotten Row, a piece of road set apart for equestrians; the Serpentine, a large sheet of ornamental water, much frequented in summer for bathing, and during frosts for skating; and the Albert Memorial, a structure in memory of the Prince Consort.

Hyderabad, or HAIDARABAD (hī-der-ā-bād'), a state of Hin-

dustan, which comprehends the greater part of that central plateau of Southern India known as the Deccan, and is in possession of a Mohammedan prince, the Nizam; area 82,700 sq. miles, exclusive of the Berar or Hyderabad Assigned Districts under British administration. The country is intersected or bounded by the Godavery, Kistnah, and their tributaries. The soil is fertile, though much good land is not yet brought under cultivation. The chief products are rice, wheat, maize, sugar-cane, tobacco, cotton, indigo, fruits and timber. Pop. 11,174,897. The ruler of Hyderabad belongs to a dynasty founded by Asaf Jah, a distinguished soldier, whom the Emperor Aurungzebe made viceroy of the Deccan in 1713, with the title of Nizam or Regulator. Mir Mahbub Ali, the present Nizam, was born in 1866, and is in point of rank the first Mohammedan ruler in India, with a regular army of about 15,000, besides numerous irregulars.—HYDERABAD, the capital, is situated on the River Musi, at an elevation of 1672 feet above the sea. It is surrounded by a stone wall flanked with bastions, forming an irregular quadrangle about 2¾ miles upon the river and 2 miles broad. Among the chief buildings are the extensive palace of the Nizam, the British residency, the Char Minar, or Four Minarets, built about 1590 as a Mohammedan college, but now used for warehouses; the Jama Masjid, or cathedral mosque, designed after the one at Mecca. There are manufactures of silks, trinkets, and turbans. Pop. of city, with suburbs, is given as 500,623.

Hyderabad, or HAIDARABAD, a town of Hindustan, capital of Hyderabad District, Sind. It is situated on a rocky eminence about 3 miles from the eastern bank of the Indus. The streets are narrow and dirty, and the houses mere hovels. The fort contains the arsenal of the province of Sind and the palace of the Emirs. The principal manufactures are arms, silks, cottons, and lacquered ware. Pop. 75,952.

Hyder Ali (hī'der ä'lē), a distinguished Indian prince, born in 1728, son of a general in the service of the Rajah of Mysore. By his military talents he became the actual ruler of Mysore, and in 1762 deposed Kandih Rao, and had himself chosen Rajah. He encouraged agriculture and commerce, reorganised the army, and so greatly extended his dominions that in 1766 they contained 84,000 sq. miles, and afforded an immense revenue. In 1780 he formed an alliance with the Mahrattas against the English, took Arcot, but was defeated by Sir Eyre Coote, June 1, 1781. The Mahrattas now joining in a league against him, he carried on a disadvantageous war, during the continuance of

Hyder Ali.

which he died, in 1782. He was succeeded by his son, Tippoo Saib.

Hydra (hī'dra), in Greek mythology, a celebrated monster, which infested the neighborhood of Lake Lerna, in the Peloponnesus. Some accounts give it a hundred heads, others fifty, others nine. As soon as one of these heads was cut off two immediately grew up if the wound was not stopped by fire. It was one of the labors of Heracles to destroy this monster, and this he effected with the assistance of Iolaus, who applied a burning iron to the wounds as soon as each head was cut off. See *Heracles*.

Hydra, an island of Greece, on the east coast of the Morea; length, 12 miles; breadth, about 3. Its surface, though not very elevated (highest point 1939 feet), is almost entirely composed of bare, sterile rocks; and the inhabitants, most of whom liv in the town of Hydra, on the northwestern shore, are engaged in trade and commerce. During the war of independence the security which the island afforded raised its population for a time to 40,000; and the Hydriotes, with their fleet, played an important part in the struggle. Pop. of island, 7342; of the town, 6446.

Hydra (in zoölogy). See *Hydrozoa*.

Hydrangea (hī-dran'jē-a), a genus of shrubs or herbs of the nat. order Saxifragaceæ, containing

about thirty-three species, natives of Asia and America. The garden hydrangea (*H. hortensis*) is a native of China and was introduced into Britain by Sir J. Banks in 1790. It is a favorite for the beauty and size of its flowers.

Hydrates (hī'drāts), compounds of water with elementary substances or with other compounds. Hydroxide has much the same significance, but in the hydrate the water is supposed to retain its integrity, while in the hydroxide its elements have entered into new combinations.

Hydraulic Crane (hī-draw'lik), a crane wrought by the pressure of water applied on the principle of the hydraulic or hydrostatic press (which see). The mechanism consists of one or more such presses, with sheaves or pulleys and chains for the purpose of obtaining an extended motion in the chain from a comparatively short stroke of the piston. The power is applied not only for lifting the load, but also for swinging the jib, which latter object is effected by means of a rack or chain operating on the base of the movable part of the crane, and connected either with a cylinder and piston having alternate motion, like that of a steam-engine, or with two presses applied to produce the same effect by alternate action.

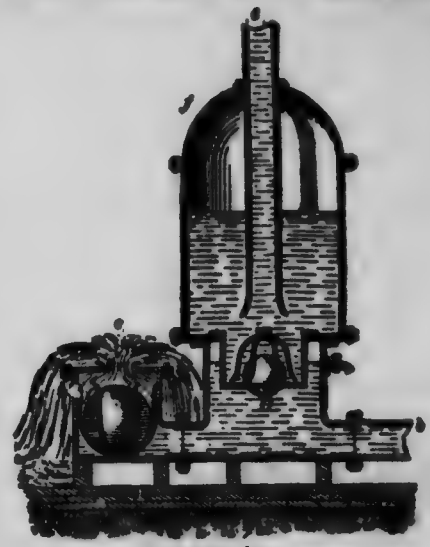
Hydraulicon (hī-draw'li-kon), an ancient musical instrument played by means of water; a water organ.

Hydraulic Engines, engines of which the motive power is water under pressure. In principle they do not differ essentially from steam engines, the water pressure acting on a piston or plunger in a cylinder, or on a revolving piston similar to that of a rotary steam engine.

Hydraulic Mining, a system of mining in which the force of a jet of water is used to sluice down a bed of auriferous gravel or earth, which is passed through sluices to detain the particles of gold.

Hydraulic Press, known also as *Hydrostatic Press* or *Bramah's Press.* See *Hydrostatic Press.*

Hydraulic Ram, a machine for raising water, and depending for its action on the impulse of flowing water. The water falling from a reservoir passes into a pipe or chamber (*b*), at the end of which there is a ball valve (*c*). The rush of supply water at first closes this, and the water finding no exit there acquires pressure enough to open another valve (*d*) and pass into an air vessel placed over it (*f*). The cessation of pressure at valve *c* allows it to fall again; an outrush of water takes place there, relieving valve *d*, which again closes. The pressure of the flowing water upon valve *c* once more closes this valve, and valve *d* again opens,



Hydraulic Ram.

and an additional quantity of water is forced into the air-vessel; and so on by a series of pulsations which send the water along the service pipe, and, in properly arranged machines, raise it to a very considerable height, although the impulse is derived only from the fall of a few feet.

Hydraulics, that part of mechanical science which has to do with conducting, raising and confining water, or of applying it as a motive power. It thus has to do with the flow of water in pipes or channels, and with the various machines in which water is utilized such as water wheels, pumps, turbines, the archimedean screw, the Barker's mill, the hydraulic ram, the hydraulic crane, the hydraulic press, etc.

Hydride (hī'drid), a substance consisting of hydrogen combined with a metal, or some other base.

Hydro-aeroplane (hī'drō-ā'er-ō-plān), an aeroplane to which pontoons or light boats have been attached to enable it to float or move on the surface of the water. This device has been much used by aeronauts of recent years because of the greater ease and safety in rising from and landing on the water. The term 'hy-

ing-boat' is sometimes applied to machines of this type.

Hydrocarbons (hī-drō-kär'bunz), in chemistry a series of compounds which consist of carbon and hydrogen only. They are produced chiefly by the decomposition of organic substances, either slowly by natural causes, or by artificial means, as in the case of the destructive distillation of coal for the purpose of making gas. Certain of the hydrocarbons are also found in the gums of trees. Among the best known are paraffin, benzine and turpentine.

Hydrocele (hī'dro-sēl), a collection of serous fluid in some of the coverings of the testicle or spermatic cord, or in the areolar texture of the scrotum. It is generally the result of a strain or an inflammation of the testes. A large tumor is formed, filled with fluid, which has to be frequently drawn off. Radical cure in adults is effected by tapping or by incision.

Hydrocephalus (hī-drō-sef'a-lus), an accumulation of fluid within the cavity of the cranium; dropsy of the brain. See *Dropsy*.

Hydrocharidaceæ (hī-drō-char-i-dā'se-ē), a nat. order of monocotyledonous floating and creeping plants, inhabiting ditches, rivers and lakes in various parts of the world. See *Arrocheris*.

Hydrochloric Acid (hī-drō-klō'-rik), or MURIATIC ACID (H Cl), a gaseous compound of equal volumes of hydrogen and chlorine. It is evolved during volcanic eruptions, and is found in the water which collects in the crevices of mountains, and in rivers which rise in volcanic formations. It may be produced by decomposing common salt with sulphuric acid, or by bringing equal volumes of chlorine and hydrogen together and exposing the mixture to diffused daylight without condensation. It explodes in direct sunlight. Hydrochloric acid is colorless, has a pungent odor and an acid taste. It is quite irrespirable, extinguishes flame and dissolves very readily in water. The chief use of hydrochloric acid in the arts is to supply chlorine. It is also used in the preparation of glue, phosphorus, carbonic acid, etc. In medicine it is used diluted as a tonic and astringent. In a concentrated form it is a powerful caustic.

Hydrocyanic Acid (hī-drō-sī-an'-ik). Same as *Prussic Acid* (which see).

Hydrodynamics (hī-drō-dī-nam'-ikz), a branch of the general science of dynamics, treating specially of the laws of force as applied to fluids. It is divided into *Hydrostatics*, which is concerned with forces applied to fluids at rest, and *Hydrokinetics*, which treats of the application of forces so as to produce motion in fluids. The term hydrodynamics is, however, very often used in the latter sense, being thus opposed to hydrostatics. The name *Hydraulics* is given to the subject when considered with respect to its practical bearing on engineering science.

Hydro-electric Machine, a machine in which electricity is generated by the friction of steam against the sides of orifices through which it is allowed to escape under high pressure.

Hydrofluoric Acid (hī-dru-flūr'-ik), or FLUOHYDRIC ACID (H F), an acid which may be obtained either in the liquid form or in the anhydrous form, as a colorless gas. Both the dry and the liquid form act upon the skin with great virulence. Hydrofluoric acid is used chiefly for etching upon glass. The glass is covered with a thin coating of etching wax, and the design is traced through the wax down to the glass with a fine-pointed instrument. The plate is then treated with an aqueous solution of the acid or is exposed to the gas itself. After a sufficient length of time the wax is dissolved away and the design becomes visible. In chemistry hydrofluoric acid is used to decompose and dissolve silicates in mineral analysis.

Hydrogen (hī'dru-jen), an important elementary substance, one of the elements of water and a component of all vegetable and animal products. It may be obtained by passing the vapor of water over red hot iron filings, or by submitting water to the action of an electric current, whereby it is decomposed into its elements hydrogen and oxygen. Pure hydrogen is a colorless, tasteless, inodorous gas; it is very inflammable, burning with a pale, very slightly luminous, but intensely hot flame; it is a powerful refractor of light; the least dense and the most rapidly diffusible of all the gases and the lightest body in nature, being about 14½ times lighter than atmospheric air, with a specific gravity of .0693. In consequence of its extreme lightness it is the recognized standard of unity in referring to the atomic weight of bodies, and it has also been assumed as the unit in speaking of the specific gravity of gases, although common air is the more generally received standard. Hydrogen cannot support respiration, but is not directly poisonous,

death ensuing from mere absence of oxygen. Two volumes of hydrogen with six of air form an explosive mixture. The most intense heat that can be produced is caused by the burning of hydrogen in oxygen gas, and this principle has been applied to increase the temperature of blast-furnaces in iron-works by making the gases pass separately through heated tubes to the furnace. Hydrogen is only slightly soluble in water, nor is there any other liquid which is capable of dissolving it in great quantity. Hydrogen gas can be liquefied by exposure to 650 atmospheres pressure and —140°C., but remains liquid at 320 atmospheres pressure, the temperature remaining the same. It was solidified in 1899 by causing it to evaporate when in the liquid state. It unites with all other elementary gaseous bodies, and forms with them compounds, not only of great interest, but of vast importance and utility; with nitrogen it forms ammonia; with chlorine, hydrochloric acid; with fluorine, hydrofluoric acid, etc.

Hydrography (hī-drog'ra-fī), that branch of geographical science which has for its object the description and natural phenomena of the water on the surface of the globe, whether in seas, lakes, or rivers. It may deal with the rivers, watersheds, lakes, etc., of a particular country; and it also embraces the determination of winds, currents and other departments of marine surveying. In Britain, France, the United States, etc., there are hydrographic departments kept up by government, which publish accurate charts of coasts, issue sailing directions, etc.

Hydrokinetics (hī-dru - kī-net'iks), that branch of hydrodynamics which treats of the application of forces producing motion in fluids, having thus to do with the flow of liquids in pipes, its issue from orifices under certain pressures, etc. See *Hydrodynamics*.

Hydrometer (hī-drom'e-tėr), an instrument primarily for determining the specific gravity of fluids, though some of them can also determine the specific gravity of solids. The hydrostatic principle on which the use of the hydrometer depends is the well-known one that when a solid body floats in a liquid, and thus displaces a quantity of the liquid, the weight of the solid body is equal to the weight of the liquid that it displaces. The density of the liquid is determined either by observing the depths to which the hydrometer sinks in the liquid (the hydrometer of variable immersion) or the weights required to make it sink to a given depth (the hydrometer of constant immersion). Of the second kind of hydrometer Nicholson's is a good example. It consists of a hollow cylinder of metal, surmounted with a very fine metallic stem, to the top of which there is attached a plate or pan for weights. From the bottom of the metallic cylinder hangs a kind of cup or basket. The whole instrument is weighted so as to float upright. On the fine metallic stem there is a marked point; and by putting weights on the upper pan the hydrometer is always made to sink precisely to this point. Thus the volume immersed is always the same. From what was said above, it is seen at once that different weights are required to sink it to the marked point in different liquids, the denser the liquid the greater being the weight required; and if the weight of the instrument itself is known, and also the *standard weight*, or weight required to sink it to the marked point in distilled water, the calculation of the specific gravity of any liquid from an observation with the instrument is very easy. But the specific gravity of solids can also be found by means of Nicholson's hydrometer, for which purpose the instrument is placed in distilled water and the solid body is put on the upper pan. Weights are then added till the hydrometer sinks to the marked point. But the *standard weight* of the instrument being known, it is plain that the difference between it and the weights that must be added on the upper pan to the weight of the body whose specific gravity is to be determined must be the weight in air of that body. The body is now transferred to the basket below the instrument, and the additional weights which must now be placed in the dish represent the weight of water displaced by the solid; and the weight of the solid itself divided by this weight is the specific gravity required. Hydrometers of variable immersion are usually made of glass. Each of them has a large hollow bulb, below which there is a smaller bulb weighted with mercury to make the instrument float upright. The stem is cylindrical and is graduated, the divisions being frequently marked on a piece of paper inclosed within the stem. The depth to which the hydrometer sinks in the liquid gives the density.

Hydrometer

Hydromys (hī'drō-mis), a genus of water-mice found in Australia and adjacent islands, distinguished

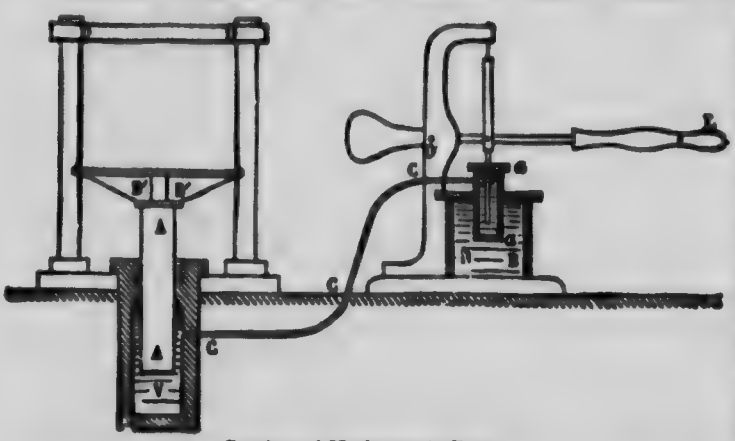
from all other rodents by its small number of molar teeth. The largest species is twice the size of a common rat. In Tasmania they are called beaver-rats, are nocturnal and very shy, inhabit the banks of both fresh and salt water, and swim with the help of partly-webbed hind feet.

Hydropathy (hī-drop'a-thi), a method of treating diseases by the use of pure water both internally and externally, which has come extensively into practice. The system was originated by Vincent Priessnitz, a Silesian peasant, who in 1829 established at his native village of Gräfenberg an institution for the hydropathic treatment of diseases, and invented a variety of forms in which the water cure might be applied, such as the wet-sheet pack, the dry blanket or sweating pack, the sitz, douche, plunge, wave, etc., baths. The new system soon acquired popularity, and the original establishment expanded into an extensive suite of buildings. Other hydropathic institutions soon sprung up in other parts of Germany. In 1842 a hydropathic society was formed in London, and ere long numerous establishments were erected all over the United Kingdom. Before Priessnitz's death in 1851 he had the satisfaction of seeing his system adopted throughout Europe, as well as in the United States, where it was introduced in 1845 and spread widely, though it is now little used. In many cases there can be no doubt of patients having received great and lasting benefit by a sojourn at a hydropathic institution, and the free use of water in its various forms of appliance; but it may well be doubted whether these advantageous results are not as much to be attributed to the ablutions, exercise and diet to which in such circumstances the patients readily conform themselves as to the wet bandages, douches and other forms of hydropathic treatment.

Hydrophane (hī'dru-fān), a variety of opal, made transparent by immersion in water. See *Opal*.

Hydrophobia (hī-dru-fō'bi-a; Greek *hydōr*, water, and *phobos*, fear), a specific disease arising from the bite of a rabid animal. The animals most liable to be afflicted with madness are dogs; but cats, wolves, foxes, etc., are also subject to it. The early symptoms of rabies in the dog are such as restlessness and general uneasiness, irritability, sullenness and inclination for indigestible and unnatural food, and often a propensity to lap its own urine. As the disease proceeds the eyes become red, bright and fierce, with some degree of strabismus or squinting; twitchings occur round the eye, and gradually spread over the whole face. After the second day the dog usually begins to lose perfect control over the voluntary muscles. He catches at his food, and either bolts it almost unchewed, or, in the attempt to chew it, suffers it to drop from his mouth. The want of power over the muscles of the jaw, tongue and throat increases until the lower jaw becomes dependent, the tongue protrudes from the mouth, and is of a dark, and almost black color. A peculiar kind of delirium also comes on, and the animal snaps at imaginary objects. His thirst is excessive, although there is occasionally a want of power to lap. His desire to do mischief depends much on his previous disposition and habits. He utters also a peculiar howl, and his bark is altogether dissimilar from his usual tone. In the later stages of the disease a viscid saliva flows from his mouth, and his breathing is attended with a harsh, grating sound. The loss of power over the voluntary muscles extends, after the third day, throughout his whole frame, he staggers in his gait, and frequently falls. On the fourth or fifth day of the disease the dog dies, sometimes in convulsions, but more frequently without a struggle. In regard to man the rabid virus seems to be more violent when it proceeds from wolves than from dogs. It appears to be contained solely in the saliva of the animal, and does not produce any effect on the healthy skin. But if the skin is deprived of the epidermis, or if the virus is applied to a wound, the inoculation will take effect. The development of the rabid symptoms is rarely immediate; it usually takes place before the twenty-first day, but in some cases it has been reported as having occurred after six months or even longer. It begins with a slight pain in the scar of the bite, sometimes attended with a chill; the pain extends and reaches the base of the breast, if the bite was on the lower limbs, or the throat, if on the upper extremities. The patient becomes dejected, morose and taciturn. He prefers solitude, and avoids bright light; frightful dreams disturb his sleep; the eyes become brilliant; pains in the neck and throat ensue. These symptoms precede the rabid symptoms two or three days. They are followed by a general shuddering at the approach of any liquid or smooth body, attended with a sensation of oppression, deep sighs and convulsive starts, in which the muscular strength is much increased. A foamy, viscid saliva is discharged from the mouth; the deglutition of solid matters is difficult;

the respiration hard; the skin at first, chilly, and afterwards covered with sweat; the pulse weak; the fit is often followed by a syncope; the fits return at first every few hours, then at shorter intervals, and death takes place generally on the second or third day. No means have yet been found of arresting the progress of the poisonous virus after it has once developed in the system. The treatment, therefore, consists in preventing its development, which may be effected by applying a ligature, where possible,



Section of Hydrostatic Press.

to impede the circulation from the wound, by sucking it, and thoroughly cauterizing it either with nitrate of silver or with iron heated to a white heat, the pain of cautery being less as the temperature is greater. If these means are not available, any burning substance and most acids may be used. M. Pasteur discovered a method of preventing the development of the disease by a system of successive inoculations with rabid virus of greater and greater intensity; the inoculation being made the first day with marrow extracted from a rabid animal 12 to 14 days previously, the second day with fresher marrow, continuing until marrow only one day old is used. The result of this treatment is claimed to confer immunity from infection. While this method has been favorably received, many doubt its efficacy, especially the anti-vaccinationists, and question the number of cures really performed. As a sharp critic of the Pasteur system has remarked, every one who is bitten and inoculated is counted in M. Pasteur's list, though there is nothing to prove that he would have contracted the disease.

Hydrophora (hī-drof'or-a), one of the three divisions into which Huxley and other authors divide Hydrozoa.

Hydroplane (hī'drō-plān), a motor boat or launch with bottom built in one or more planes or steps sloping toward the stern, so that when the boat is driven at high speed it tends to rise and glide over the surface of the water. This plan of construction is best adapted to light racing boats.

Hydrostatic Press (hī-drō-stat'ik), or BRAMAH'S PRESS, a hydrostatic apparatus which in its practical application was invented by Bramah in 1796. It will be understood from the accompanying figure. By means of a suction and force pump, c c, worked by the lever or handle L turning about the point O, water is drawn from the reservoir B B and forced along the tube C C into the cistern V through the top of which a heavy metal plunger A A works. On the upper end of the plunger is a large plate B' B' upon which the goods to be pressed are placed. When water is pumped from the reservoir B B into the cistern V, the pressure exerted by the plunger of the pump is transmitted according to the well-known hydrostatic principle (see *Hydrostatics*) to the bottom of the plunger A, which accordingly rises and carries the objects placed on plate B' B' up against the top of a fixed frame D D. It was the invention by Bramah of a water-tight leather collar surrounding the piston that made the use of the press practicable; before his invention not much power could be developed from the escape of the water round the piston. The collar consists of a leather ring bent so as to have a semicircular section (as seen in cut), so that the water passing between the piston and cylinder fills the concavity of the collar, and by pressure produces a packing which fits the tighter as the pressure on the piston increases. The hydrostatic press may be constructed to give pressures of two or three hundred tons, and is extensively employed where very great force is required, as in testing anchors or raising very heavy weights.

Hydrostatics, is that part of the general science of hy-

drodynamics that treats of the application of forces to fluids at rest. Among the chief principles of hydrostatics may be mentioned the following: (1) The intensity of pressure at any point of a fluid is the same in all directions; it is the same whether the surface that receives the pressure faces upwards, downwards, horizontally or obliquely. (2) When a fluid is confined, if the intensity of pressure in one part be increased, as by forcing in a piston or by any other means, an equal increase will be produced in the intensity of pressure at all other parts: in other words, pressure applied to any one part

Pascal's Principle.

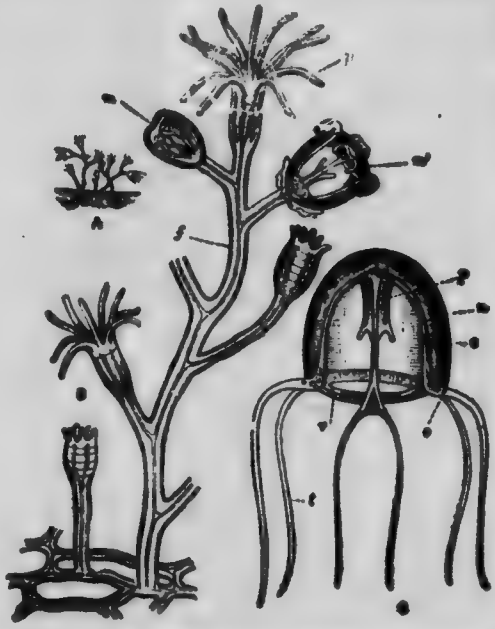
is transmitted without any change in its intensity to all other parts. The diagram will aid in the understanding of this. If pressure is applied to P it will be transmitted in all directions through the liquid. If other openings are made, and if they are fitted with pistons, the pressure that must be applied to any piston equal in area to the area of P is equal to the pressure on P; and if the area of one of the other pistons is greater or less than the area of P, the pressure required to keep it in its place is proportionately greater than or less than the pressure that is applied to P. This principle, which is known as Pascal's principle from being distinctly formulated by him, is the most important in hydrostatics, and finds a practical application in the Hydrostatic, or Bramah's Press (see above). (3) Not only is pressure transmitted out to the surface or envelope of the liquid, but within the fluid itself the particles are all pressed together. When a solid is immersed in the liquid it is pressed at every point of its surface in the direction perpendicular to the surface at that point. (4) In every horizontal layer throughout the liquid the pressure per unit area is the same; and this is the case independently of the shape of any vessel in which the liquid may be contained. The pressure per unit area in any horizontal layer depends only on the height of the free surface of the liquid above the layer considered, and the specific gravity of the liquid; and it is equal to the weight of a column of the liquid of unit sectional area whose height is the height of the free surface. Hence whatever be the shape or size of several vessels, if all have the same area of base, and if in all the water stands at the same height, the pressure on each of the bases is the same. (5) When a solid is immersed either partially or wholly in a liquid a portion of the liquid is displaced. The solid is at the same time pressed at every point by the liquid. But the upward pressure on the solid is greater than the downward by an amount equivalent to the weight of the liquid displaced by the solid. Hence we obtain what is called the principle of Archimedes, namely, that a body immersed either wholly or partially in a fluid loses a portion of its weight equal to that of the fluid which it displaces. This principle is of great importance as regards the flotation of bodies, and the determination of specific gravity, etc. In regard to the sinking or floating of bodies three different cases may thus arise: First, the weight of the body may exceed the weight of the liquid it displaces, in which case the body sinks in the liquid; Second, the weight of the body may be less than that of the liquid displaced, in which case the body will not remain submerged unless forcibly held down, but will rise to the top and partly out of the liquid until the weight of the liquid displaced is equal to its own weight; Third, the weight of the body may be equal to the weight of the liquid displaced, in which case it will have little or no tendency either to sink or rise.

Hydrosulphuric Acid (hī-drō-sul-fū'rik), or sulphuretted hydrogen, or hydrothionic acid (H_2S), is a colorless, inflammable gas produced by the putrefaction of sulphurous organic matters. Many mineral waters contain it naturally. It may be artificially produced by burning sulphur vapor in hydrogen, or by passing hyrdogen through sulphur.

Hydrotherapy (hī-drō-thēr'a-pi), the use of water in various ways for therapeutic purposes. Externally water is being used with great success in the treatment of insanity, fever, sciatica, insomnia, sepsis in wounds, etc. Internally water is also of great service, whether in [illegible]ibed injected.

Hydrothorax (hī-drō-thō'raks), a dropsical condition of the pleura, in which the pleural cavity contains a serous fluid exuded from the blood-vessels, not due to inflammation.

Hydrozoa (hī-dru-zō'a), a class of animals of the subkingdom Cœlenterata, in which the walls of the body inclose a simple undivided cavity which acts both as a body cavity and a digestive cavity. The body is essentially



A, Part of the colony of *Bougainvillea muscus*, one of the compound *Hydrozoa*, of the natural size. B, Part of the same enlarged: *p*, A polypite fully expanded; *m*, An incompletely developed reproductive bud; *m'*, A more completely developed reproductive bud; *f*, Cœnosarc with its investing periderm and central canal. C, A free reproductive bud or medusiform gonophore of the same: *n*, Gonocalyx; *p*, Manubrium; *c*, One of the radiating gastrovascular canals; *o*, Ocellus; *v*, Velum; *t*, Tentacle. (After Allman.)

composed of two layers, an outer layer or ectoderm and an inner or entoderm. Reproductive organs are developed as external processes of the body-wall, but reproduction also takes place by fission. The Hydrozoa are all aquatic and almost all marine. The fresh-water hydra is a very good type of the class. The body is quite soft, and when fully contracted appears like a particle of matter resting on the surface of a plant or stone; but when expanded it shows a long slender body of a bright green or light brown color. One end of the body develops into a number of long slender tentacles, within which, near their bases, the mouth of the animal is found. This is the *distal* or free-growing end. The other and more slowly growing end is known as the *proximal*, and ends in a kind of disc or foot by which the hydra attaches itself to objects. The body is hollow from one end to the other. It is found most in semistagnant waters, where, hanging from its foot-disc, with its long tentacles expanded, it seizes on the small crustaceans or other suitable prey which comes in contact with it. Its tentacles have a stinging power which soon paralyzes its prey. Under favorable conditions one or more hydræ are usually found attached to the parent form. Such are produced by a process of budding from the parent. Each of these ultimately separates from the parent stem and becomes an independent hydra. The Hydrozoa are divided by Prof. Nicholson into six subclasses, viz., the Hydroida, the Siphonophora, the Lucernarida, the Graptolitoidea, the Hydrocorallinæ and the Stromatoporoidea.

Hyena (hī-ē'na), a genus of digitigrade carnivorous quadrupeds, constituting a family which unites the skull characters of the Felidæ (cats) with the skeleton and gregarious habits of the Canidæ (dogs). The characters of this genus are five molars above, and five or four below, on each side, the three anterior molars being conical, smooth, and remarkably large, adapted for breaking the bones of their prey; the tongue is rough; the legs are each terminated by four claws; the forelegs are longer than the hind legs; the eyes large and prominent; the ears long and acute; the jaws are remarkable for the strength of their muscles, and can crush the hardest and most massive bones with ease. The genus is confined to Africa and Asia. There are three species known—the striped hyena (*Hyæna striata*), whose general color is a grayish-brown, diversified with blackish stripes, which run along the ribs, and upon the limbs, these peculiar marks distinguishing it from the other species; the spotted hyena (*Hyæna crocuta*), so named on account of the well-defined spots that are scattered over its body and limbs; and the brown hyena (*Hyæna brunnea*), whose fur is of a blackish-brown tint, diversified with a lighter color around the neck. The term 'laughing hyena' is applied to the spotted hyena which utters strange sounds that resemble hysterical laughter. This animal is also called the tiger wolf.

They are extremely voracious, feeding chiefly on carrion, and thus being of great utility in the countries where they live: to obtain dead bodies they will even dig up graves. Along with the true hyenas, the aardwolf of South Africa is also included in the family of Hyænidæ. An

extinct species, the *cave hyena* (*H. spelæa*) was abundant in England, France and Germany anterior to the glacial epoch, and has left its remains in many caves of these countries.

Hyères (ē-ār), a town of Southern France, department Var, 10 miles east of Toulon, beautifully situated on a declivity facing the Mediterranean. It is much frequented by patients suffering from chest or nervous disorders. Pop. (1906) 17,790.

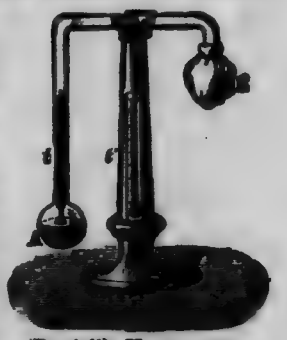
Hyères Islands, a group of islands in the Mediterranean, on the coast of France a little south of Hyères. Pop. 5755.

Hygieia (hī-ji-ē'ya), the Greek goddess of health, daughter of Asclepios, or Æsculapius. Her temple was placed near that of Æsculapius, and her statues were even erected in it. She is represented as a blooming maid with a bowl in her hand, from which she is feeding a snake, the symbol of health.

Hygieia, from antique statue.

Hygiene (hī'ji-ēn), the department of medicine which treats of the preservation of health, and the duration of life prolonged by a due attention to physiological or natural laws. It is usually divided into public and private hygiene, the former having to do with measures for excluding causes of disease (see *Quarantine* and *Vaccination*), methods of securing cleanliness in the streets and dwellings (see *Sanitation* and *Sewage*), methods of maintaining the purity of the supply of food and drink (see *Adulteration*); the latter may be considered to embrace such subjects as alimentation (see *Aliment*, *Digestion* and *Dietetics*), clothing (see *Clothing*), exercise and muscular development (see *Gymnastics*), etc.

Hygrometer (hī-grom'e-tėr), an instrument for measuring the degree of moisture of the atmosphere. The chief classes of hygrometers depend either upon absorption or upon condensation. Of the former kind is the hygrometer of Saussure, in which a hair, that expands and contracts in length according as the air is more or less moist, is made to move an index. Of the latter sort is Daniell's hygrometer. This instrument consists of a bent glass tube, terminating in two bulbs, the bulb A being two-thirds filled with sulphuric ether, and the bulb B being, at the commencement of an experiment, empty. The latter is covered with muslin. In process of construction the tube is exhausted of air, and is thus filled with vapor of ether through its entire length. A thermometer (*t*) whose bulb is immersed in the ether of the lower arm, is inserted in the tube to register variation of temperature, and a second thermometer (*t'*) is attached to the stand of the instrument, to show the temperature of the outer air. If sulphuric ether be dropped on the bulb B, as it evaporates the bulb is cooled, and the vapor of ether is condensed within it from the bulb A; while owing to the evaporation from A into B the temperature of the former gradually falls. The operation is carried on till the temperature of A is so far reduced that dew from the surrounding air just begins to condense upon it. By means of the thermometer contained in A the temperature is read off at the instant at which vapor begins to condense, and the dew-point is thus obtained. The *hygrometric condition*, that is, the ratio between the quantity of moisture that the air actually contains and the quantity which it is capable of containing at the existing temperature, is then easily deduced. Regnault's hygrometer is a modification of the principle of Daniell's instrument, the ether being evaporated by forcing air through it.



Daniell's Hygrometer.

Hykshos. See *Hycsos*.

Hylæosaurus (hī-lē-o-sa'rus), a gigantic fossil lizard discovered in the Wealden formation of Tilgate Forest, England. Its probable length was about 25 feet. It is one of the Ornithoscelida, the group which presents a structure intermediate between that of existing birds and reptiles.

Hymen (hī'men), HYMENÆUS, the god of marriage in Greek mythology. No marriage took place without his being invoked to sanction it. He is described as having around his brows the flowers of marjoram, in his left hand the flame-colored nuptial veil, in his right

the nuptial torch, and on his feet golden sandals. He is a taller and more serious Eros, and is accompanied by song and dance.

Hymenoptera (hī-men-op'tĕr-a; Gr. *hymēn*, a membrane, and *pteron*, a wing), an extensive order of insects, comprising bees, wasps, ants, ichneumon-flies, gall-flies and allied insects. They are characterized by four membranous naked wings which have comparatively few veins. The second pair of wings is always smaller than the first. The mouth parts are provided with biting jaws and a suctorial organ. The head is freely movable, and besides the lateral compound eyes there are usually

Hymenoptera. *a*, Winged male of ant; *b*, wingless worker of ant; *c*, Pupa of ant; *d*, larva of ant enlarged; *e*, the great sawfly (*Sirex gigas*).

three ocelli on the top of the head. The Hymenoptera undergo complete metamorphosis. Females have the extremity of the abdomen furnished either with an ovipositor, forming a boring organ (*terebra*), or a sting (*aculeus*). Hence the two suborders into which Hymenoptera are divided: *Terebrantia*, comprising the sawflies, gall-flies, ichneumon-flies, etc., and the *Aculeata*, which include the bees, wasps, ants, hornets, etc.

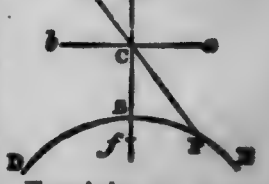
Hymettus (hī-met'us), a mountain in Attica, now called *Trelovouni*, southeast of Athens, distinguished among the ancients for the excellence of its marble and its honey. The latter is still in repute.

Hymn (him), originally a song of praise sung in honor of gods and heroes on festivals, with the accompaniments of music and dancing. Among the Hindus the hymns of the Rig-Veda, among the Hebrews the psalms, and among the Greeks the so-called Orphic and Homeric hymns are good examples. The early Christian hymns are full of devotional feeling. Their use dates from the first days of the church; but the names of the authors even of the more modern hymns cannot be discovered with certainty, though Prudentius, Paulus Diaconus and Thomas Aquinas are known to have composed some of the most esteemed. The use of hymns was sanctioned by the fourth council, at Toledo, in 633. Several of them have names derived from the words with which they begin, as the *Te Deum*, the *Gloria Patri*, etc.

Hyoid Bone (hī'oid), in anatomy, a bone shaped somewhat like the letter U, but with a wide bend and shorter limbs in proportion to the body, and having two pairs of upward projections or *cornua* (horns). It is suspended horizontally in the substance of the soft parts of the neck between the root of the tongue and the larynx.

Hyoscyamus (hī-os-sī'a-mus). See *Henbane*.

Hypatia (hī-pā'shē-a), a Greek female philosopher of the eclectic school, the daughter of Theon, a celebrated astronomer and mathematician of Alexandria towards the close of the fourth century after Christ, at which period she was born. Her father taught her not only all the branches of polite learning, but also geometry, astronomy and finally philosophy. She acquired a great reputation in the latter study, and as preceptress in the school of Plotinus gathered a numerous auditory of students from all parts of the East. She was as virtuous and beautiful as she was learned. But the zeal and the opposition of Cyril, the Patriarch of Alexandria, were aroused at the influence exercised by Hypatia; the lower and more ignorant clergy in particular were stirred against her, and at length a number of them having excited a popular tumult, seized her as she was returning from the schools, dragged her through the streets of Alexandria, stripped her naked, and finally murdered her with circumstances of the greatest barbarity (415). Charles Kingsley chose the story of Hypatia as the subject of an interesting historical romance.



Hyperbola—*a b*, *a c*, are opposite hyperbolas; *f*, *f*, foci; C, center; *A B*, transverse axis; *a b*, conjugate axis; *N C N*, a diameter.

Hyperæmia (hī-per-ē'mi-a), an excessive flow of blood to any structure of the body.

Hyperbola (hī-pĕr'bo-la), in geometry, a curve formed by

cutting a cone in a direction parallel to its axis, or so that the cutting plane makes a greater angle with the base than the side of the cone makes, and when produced cuts also the opposite cone, or the cone which is the continuation of the former, on the opposite side of the vertex, thus producing another hyperbola, which is called the opposite hyperbola to the former one.

Hyperbole (-bo-lē), a rhetorical figure, in which an idea is expressed with a fanciful exaggeration of phrase which is not to be taken too literally, but only as representing a certain warmth of admiration or emphasis. 'His fame reaches to the stars' is an example of hyperbole.

Hyperboreans (hī-per-bo-rē'anz), an ancient name for a mythical people, supposed to dwell in the extreme north of the earth. They were favorites of Apollo, and dwelt in an earthly paradise in everlasting youth and health. In modern times the term is applied to certain trees of Northeast Asia and Northern America.

Hyperdulia. See *Dulia.*

Hypericaceæ (hī-per-i-kā'se-ē), HYPERICI'NÆ, a nat. order of plants, of which the genus *Hypericum* or St. John's wort is the type. They are herbs, shrubs, or (rarely) trees, with simple, opposite (rarely whorled) leaves. They have terminal or axillary, solitary, cymose or paniculate flowers, usually yellow or white. These plants are much spread; they abound in resinous juice, and many possess medicinal properties.

Hyperæsthesia (hī-per-ēs-thē'si-a), a word indicating an excessive sensibility of the nerves of sensation, special or general. In this condition the slightest stimulus may cause a paroxysm of pain, as in tic-douloureux. In the case of the spinal nerves, bright flashes of light may be seen, sounds heard, and smells and tastes experienced with no apparent cause. Hysteria is the disease most likely to bring on this condition, but it is sometimes induced by rheumatism, gout, skin diseases, etc., and often adds to the distress in the early stages of various fevers.

Hyperides (hī-per-ī'dēz), an Athenian orator, the pupil of Plato and Isocrates, born about 400 B.C. Along with Demosthenes and Lycurgus he was one of the leaders of the patriotic and anti-Macedonian party. As an orator he was especially distinguished for his grace and subtlety of expression, as well as for his tact in handling the question under consideration. He was murdered at Ægina by emissaries of Antipater in 322 B.C. Of his orations one has reached us nearly entire; the others only in fragments.

Hyperion (hī-pēr-ī'on or hī-pē'ri-on), in the most ancient mythology of Greece, the god of the sun, afterwards identified with Apollo; also one of the Titans.

Hypersthene (hī'pēr-sthēn), a mineral of a color between grayish and greenish black, but nearly copper-red on the cleavage. It was first found on the coast of Labrador, and was called Labrador hornblende.

Hypertrophy (hī-per'tru-fē), literally over-nourishment, is an excessive development of the body or any of its organs by actual increase of the particular parts composing it, as increase of muscular fibre in the heart. It arises from continued oversupply of blood to the part, due it may be to chronic irritation of the part, as for example thickening of the skin in the neighborhood of a chronic ulcer; or it may be due to excessive use of the part. The cure of hypertrophy is attended with difficulty. The diseased organ must be kept at rest if possible.

Hyphomycetes. See *Fungi.*

Hypnotism. See *Mesmerism.*

Hypnum (hip'num), one of the largest genera of mosses, including above ninety species, natives of Britain. Many of the species are very large and ornamental.

Hypocaust (hip'o-kast), in ancient baths, etc., an arched chamber in which a fire was kindled for the purpose of giving heat to the rooms above it. The heat was distributed by means of tubes of earthenware.

Hypochlorites (hī-pu-klor'īts), salts, chiefly important as powerful oxidizing and bleaching agents; not, however, when pure, but when containing chlorides. The chief hypochlorites, or at least the complex substances which contain hypochlorites, are bleaching-powder, and the bleaching liquors made with potash and soda.

Hypochondria (hip-u-kon'dri-a), a disorder arising from a disturbance of the functions of the nervous system. It is a form of melancholia. The sufferer lives under the generally groundless apprehension of different diseases. Uninterruptedly occupied with the state of his body he takes notice of every feeling, and wishes to have every trifling pain explained, considering every one as a symptom of a serious disease.

For everything he wants physic. Hypochondria is, physically considered, not a dangerous disease, although it makes the life of the sufferer a torment to himself and his friends. It is occasioned mainly by too great mental exertion, by too sedentary a life, by sexual indulgence or excess in exciting liquors; and also by want of exercise of the physical and mental powers producing ennui. It can be cured, but slowly, by the avoidance of the habits likely to occasion it, by the adoption of a steady and regular life, with moderate exercise for the mind and body, and by the frequent enjoyment of cheerful society.

Hypodermic Injections (hī-pu-dėr'-mik), injections of some substance beneath the skin; a method adopted in medicine when the condition of the stomach or other organs renders the use of drugs by the mouth objectionable, or when rapidity of action is desired. The medicine is introduced by a small glass or metal syringe fitted with a long hollow, needle-shaped point of steel, which is thrust through the skin.

Hypophosphites (hī-pu-fos'fīts), salts of hypophosphorous acid, especially certain medicinal salts, chiefly the hypophosphites of potassium, sodium and calcium. They have been used with considerable advantage in disorders of the blood and the digestive organs, and have also been found of benefit in consumption, although failing to effect a cure.

Hyposulphites (hī-pu-sul'fīts), salts of hyposulphurous acid. Among the most important are the hyposulphites of sodium and calcium, the former of which is used in medicine as an external remedy in parasitic skin disorders and an internal one in checking fermentation in zymotic diseases. It is variously used in bleaching, photography, and other arts as an antichlore, a dissolvent of bromide and iodide of silver, etc.

Hypotenuse (hī-pot'e-nūs) in geometry, the longest side in a right angled triangle, namely that one which subtends or is opposite to the right angle. One of the most important propositions of Euclid's *Elements* is the forty-seventh of the first book, discovered by Pythagoras, which proves that the square described on the hypotenuse is equal to the sum of the squares described on the other two sides.

a b, Hypotenuse.

Hypothecation (hī-poth-e-kā'shun), the act of assigning something in security without giving up the possession of it. See *Bottomry*.

Hypothesis (hī-poth'e-sis), etymologically a supposition; is popularly used to denote something not proved, but assumed for the sake of argument. In scientific and philosophical usage it denotes either a probable theory of phenomena not yet fully explained, or a strictly scientific theory which accounts for all the known facts of the case, and which only needs the verification of subsequent observations and deductions to become a certainty. Thus the conjecture of Newton that the force of gravity, as exemplified on the earth, might extend to the moon, was in its first stage a probable hypothesis; but when it was found to account for all the facts, it became a scientific hypothesis or theory. The word theory is frequently used where hypothesis should be employed.

Hypsiprymnus. See *Kangaroo-rat*.

Hypsometry (hip-som'e-tri), the measurement of heights. See *Heights*.

Hyracotherium (hī-ra-ku-ther'i-um), a genus of fossil Pachydermata, belonging to the odd-toed division, intermediate between the hog and the hyrax, occurring in the tertiary strata of England. The species are of the size of a hare.

Hyrax (hī'raks), a genus of pachydermatous mammalia, intermediate in their character between the rhinoceros and the tapir. It is the only genus of the order Hyracoidea, characterized by having no canine teeth, but long, curved incisors. The front feet have four toes, and the hind feet three. The Cape hyrax is by the colonists of South Africa called *Rock-badger* and *Rock-rabbit*.

Hyrcania (hėr-kā'ni-a), a province of ancient Asia, corresponding to what are now the northern parts of Khorasan and Mazanderan, along the Caspian Sea.

Hyrcanus (her-kā'nus), the name of two Jewish high-priests and rulers of the Asmonean family; —John Hyrcanus, the son and successor of Simon Maccabæus, assumed the title of prince and the high priest in 137 B.C., freed Judæa from the yoke of the Syrians, and founded a dynasty of rulers which lasted till the accession of Herod. He also subjugated the Samaritans and Idumæans. He died in 105 B.C., leaving five sons, two of whom, Aristobulus and Alexander, afterwards governed with the

title of kings.—JOHN HYRCANUS II, grandson of the former, was appointed king in Jerusalem, but was forced by his brother Aristobulus to retire into private life. Pompey, however, appointed him high priest in B.C. 63. About 40 B.C. he was taken prisoner by the Parthians and carried with them to Seleucia. Here he remained till he was invited to Jerusalem by Herod, son of Antipater. Being suspected of plotting against Herod, he was put to death in B.C. 30.

Hyssop (his'up; *Hyssōpus*), a genus of plants of the nat. order Labiatæ. The common hyssop (*Hyssōpus officinālis*) is a perennial shrubby plant rising to the height of 2 feet, a native of Siberia and the mountainous parts of Austria, but common in our gardens. It flowers from June to September. The leaves have an agreeable aromatic odor, and a slightly bitter and somewhat warm taste. It was once esteemed as a medicine, but has now fallen into disuse. The hyssop of Scripture (the symbol of spiritual purification from sin) is generally identified with the caper (*Capparis spinōsa*).

Hyssop (*H. officinālis*).

Hysteria (his-tē'ri-a), a nervous affection to which women are subject, generally occurring in paroxysms, characterised by alternate fits of laughing and crying, convulsive struggling alternately remitting and exacerbating, sense of suffocation, palpitation of the heart, the sensation of a ball ascending from the pit of the stomach, occasioning a feeling of strangulation (*globus hystericus*), etc. Women of a delicate habit, and whose nervous system is extremely sensitive, are the most subject to hysterical affections; and the habit which predisposes to these attacks is acquired by inactivity and a sedentary life, grief, anxiety and various physical disorders. They are readily excited, in those who are subject to them, by strong emotions, especially if sudden. Hysterical complaints are best prevented by a judicious care of the moral and physical education of girls. Men are sometimes, but rarely, subject to disorders not essentially different.

Hythe (hith), a borough of England, one of the Cinque Ports, in the County of Kent, 11 miles W. S. W. of Dover, to the west of Folkestone, at the foot of a steep hill or cliff. It was anciently a place of great importance; but its harbor has been entirely silted up. It has become a fashionable resort for sea-bathing, and there is here a government school of musketry. A promenade over five miles along the coast was opened in 1881. Pop. (1911) 6387.

I

I, the ninth letter and the third vowel of the English alphabet, in which it represents not only several vowel sounds but also the consonantal sound of *y*. The two principal sounds represented by it in English are the short sound as in *pit*, *pin*, *fin*, and the long as in *pine*, *fine*, *wine*, the latter being really a diphthongal sound. It has also three other sounds, viz., that heard in *first*, *dirk* (ẽ, the neutral vowel); that heard in *machine*, *intrigue* (which, however, can scarcely be considered a modern English sound); and the consonant sound heard in many words when it precedes a vowel, as in *million*, *opinion*, *trunion*. I and J were formerly regarded as one character.

Iamblichus (I-am'bli-kus), a Greek Neo-Platonic philosopher, a native of Chalcis in Cœle-Syria, who flourished in the beginning of the fourth century after Christ. He was the pupil of Porphyry, and having become perfect in the doctrines of the Plotinian school, he taught with vast reputation. His school produced many eclectic philosophers, who were dispersed throughout the Roman Empire. His philosophical works now extant are: a *Life of Pythagoras;* an *Exhortation to the Study of Philosophy; Three Books on Mathematical Learning;* a *Commentary upon Nicomachus' Institutes of Arithmetic;* and a *Treatise on the Mysteries of the Egyptians, Chaldeans, and Assyrians.* He died at Alexandria about 333.

Iambus (I-am'bus), in prosody, a foot of two syllables, a short and long one (⏑ —), or an unaccented syllable followed by an accented one. The iambic meter is the fundamental rhythm of many English verses. The verse of five iambic feet is a favorite meter, being the heroic verse of English, German, and Italian poetry.

Ianthina (i-an'thi-na; Gr. *ianthinos*, violet-colored), a genus of oceanic gasteropodous mollusca, with a thin, violet-colored, snail-like shell. When irritated they pour out a violet secretion, which colors the surrounding water and serves for their concealment, in the same manner as the ink of the cuttle-fish.

Ibadan (ē-bä'dan), a town of Western Africa, in the Yoruba country, about 70 miles north of the Bight of Benin. Pop. said to be about 150,000, a few of them whites.

Ibague (ē-bä-gä'), a town of South America, Republic of Colombia, department of Tolima. Pop. (1912) 23,607.

Ibañez (ē-bä'nyes; Spanish pron. ē-bä'nyäth), VICENTE BLASCO, a Spanish novelist (1867-), born at Valencia, Spain. His first novel to attain popularity in America was *Four Horsemen of the Apocalypse.* This was followed by *Mare Nostrum* and others.

Ibarra (ē-bär'rä), a town of Ecuador, 60 miles north of Quito. Pop. estimated at 10,000.

Iberia (i-bē'ri-a), in ancient geography:—(1) A fertile district in Asia, between the Euxine and Caspian Seas, a part of modern Georgia. (2) An ancient name of Spain.

Iberis (I-bē'ris), a genus of cruciferous plants, of which several species are cultivated in gardens under the name of *candytuft.*

Iberville (ē-bar-vēl), PIERRE LE MOYNE SIEUR D', a French-Canadian soldier and naval officer, founder of Louisiana, born in Montreal in 1661; died in 1706. He saw much service with the French during their earlier struggles with the English, being in the expedition which won Fort Nelson (1686), the invasion of Newfoundland and the naval fights of 1697 in Hudson Bay. Sent to establish a French post at the mouth of the Mississippi, he founded Biloxi, Miss., in 1699, and subsequently a post on Mobile Bay and another on Dauphin Island.

Ibex (ī'beks), a name of several species of goats. The horns of the male are flattened, have two longitudinal ridges at the sides, and are crossed by numerous transverse knots. The best-known varieties are the *Capra ibex* of the Alps and Apennines, and the *C. Sibirica*, the bearded ibex of the Himalayas. Another

species, *C. ægagrus*, inhabits the lofty rocky peaks of Mount Caucasus. Some writers say that the enormous horns of the ibex are employed by their owner as buffers, by which the force of a fall may be broken, and that the animal, when leaping from a great height, will alight on its horns, and by their elastic strength be guarded from the severity of a shock that would be fatal to other animals. The ibex has remarkable powers of endurance, being capable of sustaining life without food or water for a very long time. The color of the ibex is a reddish-brown in summer, and gray-brown in winter. There is a darker stripe along the spine and over the face. They are exceedingly wary, and difficult game for the hunter because of the nature of the country where they roam and their capacity to escape by way of the steepest precipices, impossible for man.

Ibicui (ib'i-kwi), a river of Brazil, which rises in the Serra de Santa Anna, province of Rio Grande do Sul, and joins the Uruguay at Yapeyu after a course of 400 miles.

Ibigau (ib'i-gä; *Nyctibius grandis*), a very large goat-sucker inhabiting South America; sometimes called the *grand goat-sucker*.

Ibis (i'bis), a genus of birds allied to the storks, the most remarkable species being the *Ibis religiosa*, or sacred ibis (also called *Threskiornis religiosa*). This is found throughout Africa. It is about the size of a common fowl, with head and neck bare, and white plumage, the primaries of the wings being tipped with black and the secondaries being bright black, glossed with green and violet. It was reared in the temples of ancient Egypt with a degree of respect bordering on adoration, and after death was preserved in a mummified condition. The cause of its being deemed sacred was no doubt because it appeared in Egypt with the rise of the Nile; but it is now rare in that country, living farther south. There are several other species, as the *I. falcinellus*, or glossy ibis, nearly two feet in length, which builds in Asia, but migrates also to Egypt, sometimes visiting England; the *I. rubra* of tropical America, remarkable for its scarlet plumage; the *I. alba*, or white ibis of Florida; the *I.* or *Geronticus spinicollis*, or straw-necked ibis of Australia, etc.

Ibn-Batuta (ib'n ba-tū'ta), an Arabic traveler, born at Tangiers 1304; died at Fez 1377. He visited Egypt, Syria, Arabia, Persia, Central Asia, India, China, the Eastern Archipelago, East Africa, Central Africa, etc., and wrote an account of his travels.

Ibn-Ezra. Same as *Aben-Ezra*.

Ibrahim (ib'ra-him), the Arabic form of *Abraham*, and the name of many sultans and grand-viziers distinguished in Ottoman history.

Ibrahim Pasha, an adopted son of Mehemet Ali, viceroy of Egypt, born in 1789. He first gave signal proofs of his courage and military talents in the war with the Wahabis of Arabia, whom he completely defeated, and in the subjugation of Sennaar and Darfur. In 1825 he invaded the Morea at the head of an Egyptian army, with the view of conquering Greece for his father; but in 1828, in consequence of the interference of the great powers, was obliged to abandon the attempt. To effect his father's purpose of making Syria a bulwark to his new Egypto-Cretan kingdom he, in 1831, crossed the Egyptian frontiers with an army, overran Palestine, took St. Jean d'Acre by storm and made himself master of all Syria. The campaign terminated by an arrangement in which the Porte ceded Syria, and conferred the pashalic of Adana, by a kind of lease, personally on Ibrahim. In no long time war with the sultan again broke out, and resulted in a great defeat of the Turkish forces at Nizib in 1839. By the interference of the great powers Ibrahim was eventually obliged, after retiring from all his Syrian conquests, to return to Egypt, marching across the desert from Damascus with great loss and suffering. From this time he appeared seldom in public life, and employed himself chiefly in the improvement of his own estates. In 1846 he visited England and France. In 1848 Ibrahim, after his father had become superannuated, proceeded to Constantinople, and was nominated Viceroy of Egypt, but he died in the same year at Cairo, while Mehemet Ali was still alive. He was succeeded by Abbas Pasha, the favorite grandson of Mehemet Ali.

Ibrail. See *Braila*.

Ibsen (ib'sen), Henrik, a Norwegian dramatist and lyric poet, born in 1828. His first play, *Catilina*, was produced in Christiania in 1850. This was an ill-written production, but his *Warriors in Helgeland* (1850), and *Rival Kings* (1864), raised him to the first rank among the national dramatists of Scandinavia, and *Love's Comedy* (1862) was the first step towards his satirical social dramas. He was successively director of the theater at Bergen and of the Norske Theatre at Christiania, which he managed in 1857-62. In 1864

he left his native country and thereafter resided chiefly abroad. His dramas are partly in prose, partly in verse, and include historical plays and satirical comedies of modern life. Some of them have been rendered on the English and American stage and are very highly regarded as literary and dramatic productions. The first to attract world-wide attention was *A Doll's House* (1879). This was followed by *Ghosts*, *The Wild Duck*, *The Master Builder*, and others, psychological in their interest, but vividly realistic in language, some of them giving rise to a storm of controversy. Ibsen was also a lyric poet. He obtained a pension from the Storthing. He died in 1906.

Ibycus (ib'i-kus), a Greek lyric poet born at Rhegium, Italy, in the sixth century B.C.; lived mostly at Samos in the court of Polycrates. It is related that while on a journey he was surprised and murdered by robbers near Corinth. Finding escape impossible, he declared that the cranes which happened to be flying over their heads would avenge his death. The robbers afterwards seeing a flock of cranes, one of them said involuntarily, 'Behold the avengers of Ibycus.' They were in consequence seized, and, after confessing their crime, were executed. His writings are known only by fragments. His poetry was chiefly erotic, but sometimes mythical and heroic.

Ica (ē'ka), a coast department of Peru, area, about 8700 sq. miles; pop. 100,000.—Its capital, Ica, lies in the fruitful valley of the river Ica; pop. 9000.

Icarus (ik'a-rus). See *Dædalus*.

Ice (is), water frozen into a solid mass. Water freezes when its temperature is reduced below a certain point, which is by universal consent made a fixed point on thermometers. That point is called zero on the Centigrade and Réaumur scales, and 32° on the Fahrenheit scale. Water near the freezing point presents the curious anomaly of expanding instead of contracting, as the cooling process goes on. At 4.1° Centigrade (39.4° Fahr.) water has its maximum density-point. At temperatures below 4.1° the volume of the water increases as the temperature falls, and decreases as the temperature rises; and at the moment of solidifying the volume of the mass suddenly increases to a very considerable extent, so that ice at the temperature of freezing is one-ninth greater in volume than the water from which it is formed is at 4.1°. It is on this account that water freezes at the top first, and that ice when frozen floats at the top of the water. The temperature at which pure water becomes ice is very nearly constant under ordinary circumstances; and it is this fact, along with the ease of procuring water at the freezing temperature, or rather ice at the point of liquefaction, that has caused the temperature to be adopted as one of the fixed points in thermometers. The freezing-point is, however, slightly influenced by pressure. Increase of pressure lowers it, and the removal of pressure raises it. Salt water requires a lower temperature to freeze it than fresh water, and in the process a large part of the salt is rejected. Hence water obtained from the melting of sea-ice is nearly fresh. If water is kept perfectly at rest it may be reduced in temperature far below the freezing-point without turning into ice; but particles of solid matter such as dust must also be kept from falling into it. The expansion of water on its conversion into ice often gives rise to the exhibition of very great force, and produces very remarkable effects in nature. Much of the disintegration observed in rocks and stones during or immediately after frost is due to it, water having entered into their pores and cavities and burst off particles by its expansion. Ice, though it is very hard and brittle, possesses the property of plasticity to a very remarkable degree, and can be moulded into any form by the application of pressure. The plasticity of ice is a property of very great importance. It was discovered by Forbes, who explained the motion of glaciers on it. (*See Glaciers.*) In nature ice appears in the greatest masses in the form of glaciers and icebergs, the latter being portions which have become detached from glaciers that extend down into the sea. Ice is now an article of considerable importance from a commercial point of view, large quantities of it being shipped to warm climates from countries where it is naturally produced in abundance in winter, as the United States or Norway. Ice can now be made cheaply by certain processes and apparatus (see *Refrigerating Machines*), and a very pure and excellent article is thus produced, and has to a considerable extent replaced natural ice for domestic and other use.

Icebergs (is'bergs), large masses of ice which have become detached from the shores of the arctic regions, and float about in the ocean at the mercy of the winds and currents. They are in fact pieces of glaciers detached from the parent mass by the action of the sea and by their own accumulating

weight. They present the strangest and most picturesque forms, are sometimes miles in length, and rise to a height of perhaps 250 or 300 feet above the sea, the portion above water being calculated at about an eighth of the whole. Icebergs consist of clear, compact solid ice, with a bluish-green tint. Their cavities contain fresh water, from the melting of the ice. They are frequently encountered in the North Atlantic (of course in the southern seas as well), and have caused many a wreck. The ice that forms on the surface of the sea, called *field-ice*, is porous, incompact, and imperfectly transparent. The field-ice forms in winter and breaks up in summer. A small field is called a *floe;* one much broken up forms a *pack*.

Iceboat, ICE YACHT, a triangular wooden framework with broad end forward, mounted on three skates or runners, 8 feet long by 8 inches deep. The motive power is a large sail, fastened to a boom and yard, which may be over 30 feet long. Such boats, running on smooth ice before the wind, may attain an average speed of 30 or 40 miles an hour and sometimes reach over 60 miles. The Hudson River is a favorite field for this sport.

Ice Breaker, a powerful boat or ship, used to break the ice in rivers or harbors. All our large northern rivers use such boats to keep the channel open in the winter. The Great Lakes are kept open for navigation by this means. An ice-breaking boat employed on Mackinaw Strait has large screws at bow and stern, and breaks the ice by forcing the water up under pack-ice and throwing it up on both sides. Russia employs in the Gulf of Finland a powerful ice-breaking ship, the *Ermick*, which forces the water upward by aid of a screw, lifting and breaking the ice, which is then cast aside by the strong steel bow, leaving a broad open channel for other ships to follow.

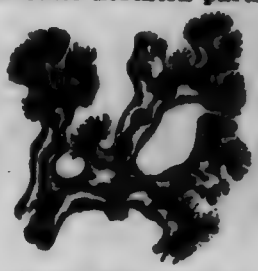
Iceland (is'land), an island belonging to Denmark, situated between the North Atlantic and the Arctic Oceans, 250 miles from Greenland and about 600 miles west of Norway; greatest length, east to west, 300 miles; central breadth, about 200 miles; area with adjacent isles, 40,437 sq. miles. In shape it somewhat resembles a heart with its narrowest point turned south. The coast-line for a considerable extent on the southeast is almost unbroken, but in all other directions presents a continued succession of deep bays or fiords and jutting promontories, thus affording a number of natural harbors. The interior has generally a very wild and desolate appearance, being covered by lofty mountain masses of volcanic origin, many of them crowned with perpetual snow and ice, which, stretching down their sides into the intervening valleys, form immense glaciers. These icy mountains, which take the common name of Jökul, have their culminating point in Oräfajökul, which is situated near the southeast coast, and has a height of 6409 feet. Among the volcanoes the most celebrated is Mount Hecla, in the south, about 5000 feet high. Numerous hot springs or *geysers* are scattered throughout the island, but are found more especially in the southwest, to the northeast of Reikjavik. (See *Geysers*.) There are numerous lakes and rivers. The most valuable mineral product is sulphur, of which the supply appears to be inexhaustible; the other minerals deserving of notice are chalcedonies, rock-crystals, and the well-known double-refracting spar, for which the island has long been famous. There is a kind of brown coal which to some extent serves as fuel. The climate is mild for the latitude, but the summer is too cool and damp for agriculture to be carried on with much success. In the southern parts the longest day is twenty hours, and the shortest four, but in the most northern extremity the sun at midsummer continues above the horizon a whole week, and of course during a corresponding period in winter never rises. Vegetation is confined within narrow limits. Almost the only tree is the birch, which has a very stunted growth, the loftiest of them hardly exceeding 10 feet. There are various flowering plants, among which saxifrages, sedums, thrift or sea-pink, etc., are common. Heath and bilberry cover large stretches. Among mosses or lichens are the edible Iceland-moss (which see). Cole, potatoes, turnips, radishes, and similar roots thrive tolerably well. But by far the most valuable crop is grass, on which considerable numbers of live stock (sheep, cattle, ponies) are fed. The reindeer, though not introduced before 1770, has multiplied greatly and forms large herds in the interior; but they are of little importance economically. Wild-fowl, including the eider-duck whose down forms an important article of commerce, are abundant; the streams are well supplied with salmon, and on the coasts valuable fisheries of cod and herring are carried on. Manufactures are entirely domestic, and consist chiefly of coarse woolens, mittens, stockings, etc. The exports are wool, oil, fish, horses, feathers, worsted stockings and mittens, sulphur, and Iceland moss.

The inhabitants are of Scandinavian origin, and speak a Scandinavian dialect which still represents the old Norse or Norwegian in great purity. They are of Protestant religion. Iceland has a constitution and administration of its own, dating from 1874. There is an *Althing* or Parliament, which meets twice a year at Reikjavik, the capital, and consists of 36 members, of whom 30 are chosen by popular suffrage, and 6 nominated by the king. A minister for Iceland, nominated by the king, is at the head of the administration, but the highest local authority is vested in the governor.

Some of the settlements of Irish monks had been made in Iceland about the end of the eighth century, but the island received the greatest proportion of its population from Norway. In 870 Harald Haarfager had made himself supreme in Norway, and as he treated the landed proprietors oppressively, numbers left the country and went to Iceland. In the course of sixty years all the habitable parts of the coast were settled. A settled government was established, a sort of aristocratic republic, which lasted for several centuries. Christianity was introduced in 981, and adopted by law in 1000; and schools and two bishoprics, those of Holar and Skalholt, were established. The Latin language and the literature and learning of the West, introduced by Christianity, were all the more warmly received, because poetry and history had already been cultivated here more than elsewhere in the Germanic north. Previously to this time the Icelanders had discovered Greenland (983) and part of America (about 1000), and they were now led to make voyages and travels to Europe and the East. Politically and ecclesiastically the most flourishing period of Iceland—the period, too, when its intercourse with the world abroad was most active—was from the middle of the twelfth to the beginning of the thirteenth century. In 1264 Magnus VI of Norway united Iceland with his own kingdom, with which it passed to Denmark in 1380, remaining with the latter in 1814, when Norway was joined to Sweden.

The Icelandic language is the oldest of the Scandinavian group of tongues, and as it is believed to exhibit the Norse language nearly as it was spoken at the date of the colonization of Iceland, it is sometimes called *Old Norse*. It is rich in roots and grammatical forms, and soft and sonorous to the ear. Icelandic literature may be divided into an ancient period, extending to the fall of the republic, and a modern, extending from that date to the present time, the former being far the richest and most original. Poetry was early cultivated, and among the most important works in Icelandic literature is the collection of ancient heathen songs called the elder or poetic Edda. (See *Edda*.) Histories and romantic works, known by the name of Sagas, are numerous. Many of these are masterpieces of prose style, and are still read with delight by the people of Iceland. The early portion of the second period was barren of anything worth mention in the way of literature, nor can the modern period boast at all of works possessing the interest of those belonging to the ancient, though since the middle of the eighteenth century there is scarcely a department of literature in which Icelandic writers have not done something. Many of the most valuable foreign works have been translated into Icelandic, and even the poems of Milton are read at many a cottage fireside. Pop. 78,489.

Iceland Moss, *Cetraria islandica*, a species of lichen found in Iceland and other northern parts of the world, and on mountains. It is used in medicine as a mucilaginous bitter, and in Iceland is collected as a nutritious article of diet. Boiled with milk or water it forms a jelly. Its bitterness may be removed by steeping.



Iceland Moss (*Cetraria islandica*).

Iceland Spar, the transparent variety of calcspar, a mineral noted for its property of exhibiting in a remarkable degree the double refraction of light.

Iceni (i-sē'ni), a warlike tribe of ancient Britain, occupying the modern counties of Suffolk and Norfolk. They fought against the Romans under their queen Boadicea.

Ice-plant (*Mesembryanthemum crystallinum*), a plant (order Mesembryaceæ) which has received the above appellation from the transparent vesicles which cover its whole surface, and have the appearance of granules of ice. It is easily grown as a half-hardy annual.

Ichang (ē-chäng'), a walled town, in the Chinese prov. of Hupei, stands on the Yang-tsze-kiang, 1000 m. from Shanghai at its mouth. In 1877 it was declared open to foreign trade. Pop. 35,000. Ichang is the transhipment port for cargo to and from Size-chuen. The imports are chiefly shirtings, lastings,

cloth, and the exports white wax, drugs, musk, tin, and silver in ingots.

Ichneumon (ik-nū'mun; *Herpestes*), a genus of digitigrade carnivorous animals belonging to the civet family. They have a long slender body, a sharp and pointed muzzle, and short legs. The most celebrated species,

Egyptian Ichneumon (*Herpestes Ichneumon*).

Herpestes Ichneumon, inhabits Egypt, where it is called *Pharaoh's rat*. It was adored by the ancient Egyptians on account of its antipathy to crocodiles, whose eggs it digs out of the sand and sucks. It is expert in seizing serpents by the neck so as to avoid any injury to itself. It is domesticated in Egypt, and more useful than a cat in destroying rats and mice. Their disadvantage, as domestic animals, is their predilection for poultry. The mongoose, or Indian ichneumon, is another species, not so large as the Egyptian, which it resembles in habits, being kept in many families as a useful domestic animal. It was introduced into Jamaica to kill the rats that infested the sugar plantations. This it effected, but has since become a nuisance from its ravages among the poultry of the island.

Ichneumon-flies, a large family of hymenopterous insects, which all agree in one particular, that they deposit their eggs either in or on the bodies, eggs, or larvæ of other insects. These apparently insignificant creatures confer inestimable benefits on man, as they destroy hosts of insects injurious to crops.

Ichneumon-fly (*Rhyssa persuasoria*).

Ichnology (ik-nol'-ō-ji), the name applied to the modern science of fossil footprints, or other impressions on rocks. The impressions are almost always found on rocks that have been deposited as mud; they are not so common in sandstone, yet they abound in the New Red Sandstone strata.

Ichthyol (ik-thi-ol), a dark red, oily liquid obtained from bituminous quartz rich in fossil fish. It is a useful antiseptic and is employed in the treatment of erysipelas, articular rheumatism, acne, eczema and other skin diseases.

Ichthyolite (ik'thi-u-lit), a petrified fish, or a stone with the impression of a fish.

Ichthyology (ik'thi-ol'ō-ji), that branch of zoölogy which treats of fishes. Fishes form the lowest of the five classes into which the great sub-kingdom Vertebrata is divided. They may be shortly described as vertebrate animals living in water and respiring the air therein contained by means of gills or branchiæ, having cold red blood, and a heart consisting of one auricle and one ventricle; and having those organs which take the form of limbs in the higher vertebrata represented by fins. Their bodies are generally covered with scales overlapping each other, and their usual form (though with much diversity) is lengthened, compressed laterally, and tapering toward both extremities. The scales of fishes assume various forms, which have been classed under the four types of *cycloid*, *ctenoid*, *ganoid*, and *placoid*. Cycloid scales are of a rounded form, and are those met with in the most familiar fishes. Ctenoid scales, like those of the perch, have spinous projections from their posterior margin. Ganoid scales are in the form of thick bony plates covered with a superficial layer of enamel. Placoid scales form detached masses of various shapes often provided with spines. The skeleton presents great variations from the amphioxus, in which the vertebræ are only foreshadowed, to the well-ossified skeleton of teleostean fishes. The vertebræ are biconcave or 'amphicœlous,' the opposed surfaces forming cups, and they vary in number from seventeen to more than 200. The spinal column is prolonged into the tail, which is two-lobed, the lobes either being equal (a *homocercal* tail) or unequal (*heterocercal*). The skull varies greatly; it may be ossified throughout as in the codfish, or the cartilaginous cranium may persist, as in the lamprey, sharks, and rays. The skull is small compared to the size of the animals themselves. The limbs, when present, are four in number. The anterior or first pair are called the *pectoral fins*. The *ventral fins*, or second pair of limbs, are variable in position, and not always present; they may be beneath the pectorals,

when they are *jugular*; behind the pectorals, when they are *thoracic*; or farther back, as *ominal*. The pelvis is represented by two triangular bones, which have no relation to the spinal column, and to which the fin-rays are directly attached. The median or vertical fins, that is, those situated on the back, are characteristic of fishes, and they may extend nearly from the head continuously to the anal aperture, as in eels; they may be broken up into several dorsals, caudal, and one or more anals, as in the cod; or the number of dorsals may be increased greatly, as in the mackerel. The fins may be wholly soft and flexible, or they may be in part rigid spines; or a series of soft fin-rays may be preceded by rigid and often formidable spines, which sometimes have a beautiful mechanism for elevation and depression. The teeth of fishes are generally very numerous, and may be placed on any part of the interior of the mouth, sometimes on the tongue. They are quite different in character from the mammalian teeth. The muscular pharynx and œsophagus lead into a stomach usually well defined, but sometimes only slightly differing in calibre from the intestine. The liver is proportionally large, and has usually a gall-bladder. The heart consists of a single auricle and ventricle, which is continued forwards by a dilated vessel called the *arterial bulb* (*bulbus arteriosus*). From this vessel the blood is sent right and left along the gills, which are the organs of respiration, and from the gills the aerated blood goes to the body. The gills or *branchiæ* are either free on one margin, as in ordinary fishes, or attached at both extremities. In the lepidosiren another structure appears, namely, lungs, which stretch through great part of the body and open on the posterior wall of the pharynx. A peculiar feature of fishes is the air-sac or swim-bladder, called also the *sound*. Anatomically its origin is identical with that of a lung; but it does not perform the function of a lung. It most probably represents an ancient lung-like organ which has degenerated, losing its original functions and assuming others. Its chief function at present is to serve as an aid in rising and sinking: but in some fishes it is prolonged so as to approach or even come in contact with the internal organs of hearing, perhaps acting as an organ of resonance. Reproduction is by ova or eggs, which in a few cases are retained in the body of the female until hatched. But the ova are usually fertilized outside the body, and the hatching process left to take place without aid. The eggs are, in most cases, in enormous numbers, as in the roe of the herring and salmon. Among the sharks the number is much less, and each ovum acquires, before exclusion, a horny sheath of various shape, but usually provided with cirri, by which it moors itself to some fixed object. In the pipe-fishes the male has a marsupium or pouch formed by folds of the abdominal integument, and in this pouch the eggs, transferred thither on exclusion, are hatched. The nervous system of fishes presents considerable variety. The amphioxus has no enlargement of the nervous trunk comparable to a brain; but in all the others the division into fore, mid, and hind brain is clearly marked. The olfactory organs are, in most cases, pits or sacs, on whose walls the olfactory filaments are spread out. The sense of taste seems less provided for, the tongue and palate being mostly firm, and often set with teeth. There is no external ear, and the internal apparatus is not wholly inclosed in bone, as in the higher vertebrates, but is partly free in the cavity of the skull. The eye is, in most cases, relatively large and flattened externally, the sight being keen. Special organs of touch are wanting for the most part, though the labial filaments, seen in the cod, whiting, mullet, and sturgeon, are of this nature. Among the most curious appliances with which fishes are provided, are the electrical apparatus that appear in some species, as in the torpedo or electric ray and the electric eel, both of which possess batteries capable of giving a shock of considerable power. Some fishes inhabit exclusively either fresh or salt water; others, as the salmon, migrate periodically from the one to the other.

Fishes may be roughly divided into two sections—the Chondropterygious or Cartilaginous fishes, having a cartilaginous or fibro-cartilaginous skeleton; and the Osseous or Bony fishes, having a bony skeleton. These two great divisions formed the basis of the classification of Cuvier. Agassiz proposed to divide fishes into four orders according to the character of their scales, viz., Ganoid, Placoid, Cycloid, Ctenoid, but this division has not been accepted.

The following divisions are now usually recognized:—

Order I.—Teleostei. Osseous or Bony Fishes, corresponding nearly to the Osseous fishes of Cuvier's classification. Characters: Skeleton more or less thoroughly ossified; two pairs of limbs usually present in the form of fins; gills free, comb-like, or tufted; usually cycloid or ctenoid scales. Sub-order I.—*Malacopteri*. Fishes with a complete set of fins supported by rays, all of which are soft,

as a rule. Examples: herring, pike, carp, salmon, eel, etc. Sub-order II.—*Anacanthini*. Fishes with fins entirely supported by soft rays; ventral fins wanting, or if present placed under the throat beneath or in advance of the pectoral fins. Examples: cod, haddock, ling, sole, turbot, and other flat-fishes. Sub-order III.—*Acanthopteri*. Fishes having one or more of the first rays of the fins in the form of spines; scales usually ctenoid; ventral fins beneath or in front of the pectorals. Examples: perch, gurnard, mackerel, mullet, etc. Sub-order IV.—*Plectognathi*. Body covered with ganoid plates, scales, or spines; ventral fins generally wanting. Examples: globe-fish, sun-fish, trigger-fish. Sub-order V.—*Lophobranchii*. Gills in the form of little tufts upon the branchial arches; scales ganoid. Examples: hippocampus, or sea-horse.

Order II.—ELASMOBRANCHII. Characters: Skeleton cartilaginous; no bones in the head, the skull forming a cartilaginous box; gills forming a series of pouches; two pair of fins supported by cartilaginous fin-rays; skin covered by placoid growths of various kinds, as tubercles, spines, etc. Sub-order I.—*Holocephali*. Jaws bony and covered with broad plates representing the teeth; only one external gill-aperture, covered with a gill-cover. The chimæra or king of the herrings is an example. Sub-order II.—*Plagiostomi*. Mouth transverse (Gr. *plagios*, athwart) and on the under surface of the head; branchial sacs opening by several distinct apertures. Examples: sharks, rays, skate.

Order III.—GANOIDEI. Characters: Body covered with ganoid plates, scales, or spines; skeleton partially ossified, the vertebral column being generally cartilaginous; skull with distinct cranial bones; usually two pairs of fins, the first rays of which are mostly in the form of spines; tail generally heterocercal. There are few living ganoid fishes, the great majority of them being found fossil. The best-known examples are the sturgeons.

Order IV.—MARSIPOBRANCHII. Characters: General form eel-like or serpentine; no paired fins to represent the limbs; only a median fin extending round the posterior extremity of the body; mouth circular and destitute of jaws proper; gills in the form of fixed pouches or sacs. Examples: lampreys and hag-fishes.

Order V.—PHARYNGOBRANCHII. The lancelet, the only example. Characters: No skull or distinct brain; no distinct heart; no vertebræ; no limbs; mouth a longitudinal fissure surrounded by filaments; walls of the pharynx perforated by ciliated slits which serve as branchiæ.

Order VI.—DIPNOI. Represented by only a few fishes, as the mud-fish or lepidosiren and ceratodus. Characters: Body somewhat eel-like in form and covered with scales; pectoral and ventral limbs both present and filiform or sometimes paddle-shaped; both gills and lungs present. These animals form a connecting link between the fishes and the amphibia.

Ichthyopsida (ik-thi-op'si-da; Greek, *ichthys*, a fish, and *opsis*, appearance), one of the three great primary divisions of the Vertebrata (the others being Sauropsida and Mammalia), comprising the fishes and amphibia.

Ichthyornis (ik-thi-or'nis; Greek, *ichthys*, a fish, *ornis*, a bird), a fossil genus of carnivorous and probably aquatic birds, one of the earliest known American forms. It is so named from the character of the vertebræ, which, even in the cervical region, have their

Fig. 1, *Ichthyornis dispar*, restored. Fig. 2, Right jaw, inner view; half natural size.

articular faces biconcave as in fishes. It is also characterized by having teeth set in distinct sockets. Its wings were well developed, and the scapular arch and bones of the legs conformed closely to the true bird type.

Ichthyosaurus (ik-thi-u-sa'rus; Greek, *ichthys*, a fish, *sauros*, a lizard), an immense fossil marine saurian or reptile, having an organization combining the characters of saurian reptiles and of fishes with some of the peculiarities of the whales. The members of this genus had four broad feet or paddles enclosed in a single sheath of integument, and a long and powerful tail. Some of the largest of these reptiles must have exceeded 30 feet in length. Their remains range from the Lower Lias to the Chalk, and the great repository hitherto has been the Lias at Lynn Regis.

Ichthyosis (ik-thi-ō'sis), or FISH-SKIN DISEASE, a roughness and thickening of the skin, portions

of which become hard and scaly, and occasionally corneous, with a tendency to excrescences. This disease seldom yields permanently to any plan of treatment yet known.

Icica (ī'si-ka), a genus of plants, nat. order Amyridaceæ, mostly large trees, natives of South America. *I. altissima*, the cedar-wood of Guiana, is a useful timber. All of these trees yield a transparent fluid resembling turpentine in many of its properties, and sometimes named *icica*, also *elemi* or *copal*.

Icolmkill (ī-kō'ni-um). See *Konia*.

Iconium (ī-kō'ni-um). See *Konieh*.

Iconoclasts (ī-kon'o-klasts), image-breakers, the party in the early Christian Church that would not tolerate images, much less the veneration of them. At first images of martyrs and bishops were placed in the churches merely to keep their memory fresh, but in the sixth century they began to be worshiped, lights being burned before them and incense offered in their honor. The eastern emperor Leo III issued an edict in 726 ordering the people to abstain from the worship of such images, and soon after he decreed their destruction. This caused great commotion, and there arose two parties in the church, the image-worshipers and the *Iconoclasts* or image-breakers, who each in turn persecuted the other. In 754 a council at Constantinople condemned image worship; in 787 the second council of Nice (Nicæa) asserted and defined the doctrine. The controversy lasted over a century, coming to an end when, under the Empress Theodora, a council held at Constantinople (842) declared in favor of the worship of images among the Greeks, a decision which was confirmed by a second council, held 869-870, in the same place. In the Western Empire also images were at first retained only to preserve the memory of pious men, but the decision of the pope, which allowed the veneration of images, finally prevailed in the Western Church. See *Iconclatry*.

Iconographic (ī-kon-o-graf'ik), written in pictures; applied to books profusely illustrated.

Iconolatry (ī-kon-ol'a-tri), the worship or adoration of the images of sacred personages connected with the Christian religion, as images intended to represent angels, the Virgin Mary, saints, martyrs, etc. Iconolatry must not be confounded with idolatry, which worships objects as being themselves divine or possessing supernatural power. The worship or adoration of images was not common in the church for several centuries after Christ, and in its earlier stages it excited strong feelings, especially in the Eastern section of the church. (See *Iconoclasts*.) The second council of Nicæa taught that images were to be retained, but that they were not to be objects of adoration in the strict sense, though it was right to salute, honor, and venerate them, and to burn lights and incense before them. This decree was rejected by Charlemagne and by a council at Frankfort in 794, but the practice of image worship finally established itself in the West. Roman Catholics maintain that the cultus of images is 'relative,' and that they are not in themselves really adored or honored, 'but that all worship and veneration is referred to the prototypes.'

Icteridæ (ik-ter'i-dē), a family of American passerine birds, allied to the starlings, remarkable for the hammock-like nests which they construct, and hence called *hangnests*. The Baltimore oriole may be regarded as typical.

Ictinus (ik-tī'nus), an ancient Greek architect of whom little is known except that he was the chief architect of the Parthenon of Athens, 438 B.C.

Icy Cape, a cape of Alaska, in the Arctic Ocean, lat. 71° N., lon. 161° W.

Ida (ī'da), in ancient geography:—(1) A mountain range in the Troad (Mysia), at the foot of which lay the city of Troy. Its highest peak was Gargarus, about 4650 feet. (2) The middle and highest summit of the mountain chain which divides the island of Crete from east to west. This peak affords a fine prospect, and is covered with woods of pine, maple and cedar, but is not fertile.

Idaho (ī'da-hō), one of the United States. It lies on the western slope of the Rocky Mountains, having Montana and Wyoming on the east, and Washington and Oregon on the west, Utah and Nevada on the south, and British America on the north; area, 83,888 square miles. It owes its rise and importance to its rich gold fields, previous to the discovery of which, in 1860 and subsequently, the territory was inhabited only by Indians. The State is largely mountainous, the summits rising to 12,000 and 13,000 feet. In the center are the Salmon River Mountains, to which belongs the picturesque and lofty Saw-tooth Range. Its chief rivers are the Lewis or Snake River and the Salmon River, the latter a tributary of the former, which again joins the Columbia. Along the course of the Snake River in the S. E. and

a. is a desert tract 400 miles long by 40 to 60 broad. There are valuable forests, but they extend over only a small area. The scenery along the Salmon River in some places is grand, the stream flowing between perpendicular walls of rock from 500 to 2000 feet high. The Snake River has three large and fine cataracts, one of which, the Shoshone Falls, rivals Niagara in magnificence when the water is high. Idaho is rich in mineral deposits, especially gold, silver, lead and copper. The output of lead in 1910 was valued at almost $10,000,000. Marble and opal are also found. Mineral springs are numerous. The climate is varied, severe in the mountains and mild in the river valleys. The higher mountain ranges are bleak and barren, but the lower hills are generally well wooded, and the soil of the valleys is productive. In general the country is better adapted for grazing than for farming, but more than 8,000,000 acres are said to be capable of irrigation, and more than 2,000,000 acres are now artificially watered. Snake River is the most important stream for irrigating purposes in the south and west. Idaho Territory was formed in 1862, then including Montana and much of Wyoming. It was reduced to its present limits in 1868, and admitted as a State in 1890. Boisé City is the capital. Pop. (1910) 325,594.

Idalium (i-dā'li-um; now DALI), a promontory of the east coast of Cyprus on which was a celebrated temple of Venus; hence her surname *Idalia*.

Iddesleigh (id'des-lē), STAFFORD HENRY NORTHCOTE, FIRST EARL OF, an English statesman, born 1818; died 1887. He was educated at Balliol College, Oxford, where he gained the highest honors; became private secretary to Mr. Gladstone in 1843, and was called to the bar in 1847. In 1851 he succeeded his grandfather in the family baronetcy. He held various offices, and represented several constituencies in Parliament, being long member for North Devon. He published a treatise, *Twenty Years of Financial Policy*, in 1862. He was made special commissioner to America to arrange the *Alabama* difficulty. Subsequently he was secretary for India (1867-68) and chancellor of the exchequer (1874-80). Upon Mr. Disraeli's elevation to the peerage he became leader of the Lower House, his task being all the more difficult on account of the Parliamentary obstruction of the Irish Home Rule party. He was elected lord rector of Edinburgh University in 1888. Lord Salisbury having undertaken to form a government, he was created (1885) Earl of Iddesleigh, and became first lord of the treasury.

Ide (īd), a fish of the carp family (Cyprinidæ), the *Leuciscus idus*, found in rocky lakes of Northern Europe. It is a good table-fish, which might be introduced into American waters.

Idea (ī-dē'a), as a term in mental philosophy, has been used in various senses. Plato regarded ideas as the archetypes or original models of things, as existing from eternity and constituting the patterns according to which the Deity fashioned the various things of which we become cognizant by our senses. According to Plato, ideas are independent of matter, and it is they that are the only objects of true knowledge. Aristotle opposed Plato's doctrine of independent ideas, but held the doctrine of ideas being types or patterns accompanying material things. By Descartes and many modern philosophers the word is employed to signify all our mental representations, all the notions which the mind frames of things. See also *Idealism*.

Idealism (ī-dē'al-izm), the philosophical term which, in contradistinction to *realism*, expresses the view that subjective or ideal existence is not only the original but the only true being, and according to which there is allowed to sensible objects merely a phenomenal existence dependent upon the mind of a thinking subject. In modern times idealism has been maintained by Descartes, Berkeley, Kant, Fichte, Schelling, and Hegel. Some of these, as Descartes and Kant, are not, however, pure idealists, inasmuch as they allow at least a problematical existence to sensible things independent of the thinking subject. Berkeley is perhaps the most thorough-going idealist, holding that what is called matter consists merely of ideas, that is, appearances produced in the mind by the direct influence of the Deity. This dogmatic idealism of Berkeley differs from the critical or transcendental idealism of Kant. This consists in the doctrine that all the material of experience is given in sensation, but on the other hand the forms of the experience (space, time, and the categories of the understanding) arise in ourselves *a priori*, and that accordingly sensible objects are known only as they appear to us and not as they are in themselves. Fichte, on the other hand, rejected the notion of things in themselves as untenable and self-contradictory, and created the system of so-called subjective idealism, according to which the I or thinking subject produces the appearance of a sensible world by a mode of activity

grounded upon its essential nature. The theories of Schelling and Hegel are developments of the Fichtean doctrine.

Identity (ī-den'ti-ti) of person in point of law must often be proved in legal proceedings, as in proving a thief, etc. The usual proof is the oath of one who was cognizant of the facts at the time referred to. A common defence of persons accused of crime is that it is a case of mistaken identity, in which case the prisoner must usually prove an *alibi* —*i.e.*, that he was in some other place at the time specified.

Ides (īdz), Latin *Idus*, with the Romans, the 15th day of March, May, July, and October. In the other months the 13th was the idea. The *ides* of March, on account of Cæsar's assassination having taken place on that day, was an *ater dies* or black day, and the senate was not allowed to sit. See *Calendar*.

Idiocy (id'i-u-si). See *Idiot*.

Idiosyncrasy (id-i-u-sin'kra-si), a distinctive peculiarity of the mental or bodily constitution of any person, or that constitution or temperament which is peculiar to any person. The more marked idiosyncracies are found chiefly in persons of neurotic type.

Idiot (id'i-ut), a person who, from original defect, is almost destitute of intelligence, or in whom the intellect seems to be almost wholly wanting. In some cases the intellectual development is so low that there appears to be little more than a vegetative life. Others not quite so low in the intellectual scale recognize the persons with whom they live, are capable of being affected by certain emotions, understand a few questions, articulate a few words, and are able to take their own food, but are quite unable to do any kind of work. Those endowed with a little more intelligence may sometimes be employed in some kinds of labor which present no complicacy or difficulty, but they are incapable of performing any intricate calculation or going through any long train of reasoning. The brain of idiots is sometimes sufficiently regular in its conformation, although in the great majority of cases there is something abnormal. The forehead is often depressed, receding, and flattened; sometimes the back parts of the head are disproportionately large. The majority of idiots are of small stature and of weak constitution, rarely living beyond forty years. The causes of idiocy are not well known. It may be hereditary.

Idocrase (ī'do-krās), a mineral sometimes massive, and very often in shining prismatic crystals. Its primitive form is a four-sided prism with square bases. It is called also *Vesuvian* or *Pryamidal Garnet*, and differs from common garnet chiefly in form.

Idolatry (ī-dol'a-tri), the worship of an image, object or symbol as having in itself some divine or supernatural power, and being able in some way to respond to the worship paid to it, such images or objects being called *idols;* or the adoration of something merely natural as something supernatural and divine. Many have regarded idolatry as a declension from the one true God, and have seen in the various forms of heathen worship only more or less complete degradations of an original revelation. Others see in idolatry an innate searching after God, and regard it as the first stage of human development, the necessary beginning of a knowledge of God. Idolatry may assume various forms; it may consist in a worship of the powers of nature, or of the heavenly bodies, or in animal worship, or in the worship of images representing mere fanciful and imaginary deities, or in the still lower fetichism.

Idria (ē'dri-a), a town of Austria, in Carniola, 21 miles southwest of Laibach, celebrated for its mines of quicksilver, which, after those of Almaden in Spain, are the richest in Europe, and employ in mining and smelting about 1300 persons. Pop. 5772.

Idris (ī'dris), a mythical figure in Welsh tradition, at once a giant, a prince, and an astronomer. His rock-hewn chair may be seen on the summit of Cader Idris, and the tradition tells that any Welsh bard who should pass the night in this chair would be found in the morning either dead, mad, or with supernatural poetic powers.

Idumea (id-u-mē'a). See *Edom*.

Idun, or IDUNA (e-dō'na), a goddess in the Scandinavian mythology, wife of Bragi, keeper of the apples of which the gods ate to keep themselves young.

Idyl (ī'dil; from Gr. *eidyllion*, a 'little image') is the name originally and still most usually applied to a short and highly finished descriptive poem, especially if it treats of pastoral subjects, though this last circumstance is not an essential character of the idyl. All that is necessary to constitute a poem of this class is that it presents to view a complete picture in small compass.

Ieisk, or YEISK (ya'isk), a seaport of Russia, on the Sea of Azov. It was laid out only in 1848, but has rapidly

increased, and now has nurseries, tanneries, tile-works, oil-mills, soap-works, etc., and a considerable trade. Pop. 35,446.

Iekaterinburg. See *Ekaterinburg*.

Ielets, or YELETZ, (yĕ'lets), a town of Russia, gov. of Orel, at the confluence of the Ielets and Lutchka. It has flourishing manufactures, and an extensive trade. Pop. 37,455.

Iesi, or JESI (yā'sē), a walled town of Italy, in the province of Ancona, 17 miles S.W. of Ancona. Pop. (commune) (1910) 24,777.

If (ēf), a small island near Marseilles, on which is the Château d'If, built by Francis I in 1529. It was later used as a state prison, Mirabeau and Philippe Egalité being among its occupants.

Iglau (ēg'lou), an old town of Austria, the largest in Moravia next to Brünn, on the Iglawa, 49 miles W. N. W. of Brünn. The staple manufacture is woolen cloth. Pop. (1910) 68,639.

Iglesias (ē-glā'zē-ās), a walled town of Sardinia, in the province of Cagliari. In its vicinity are lead, zinc, and other mines. Pop. (commune) 20,874.

Iglesias (ī-glē'sī-as), MIGUEL, statesman and soldier, was born at Cajamarka, Peru, in 1822. He became active in politics, was made minister of war, and aided in defending Lima against Chilean invasion in 1878. He was subsequently made President of Peru, and signed the treaty of peace with Chile in 1883. He lost his seat through an insurrection in 1886, and subsequently lived in Spain.

Igdrasil. See *Ygdrasil*.

Iglo (ēg'lō), a manufacturing and mining town of Northern Hungary, on the Hernad. Pop. 7500.

Ignatieff (ig-nā'tē-ef), NICHOLAS PAULOVITCH, Russian soldier and diplomatist, born in St. Petersburg, in 1832. He served in the Crimean war, and was made a colonel in 1856. In 1858 he was sent on a special mission to Bokhara and Khiva, and afterwards as ambassador to Peking 1860. He was appointed minister at Constantinople, 1864, and was envoy extraordinary, 1867-78. He was conspicuous in the negotiations before and after the Russo-Turkish war, and was appointed minister of the interior, but was dismissed in 1882. He represented the party in favor of war, in opposition to Prince Gortschakoff. He was subsequently made governor-general of Irkutsk.

Ignatius (ig-nā'shē-us), ST., Bishop of Antioch, one of the apostolic fathers, said to have been a disciple of the apostle John. His life and death are wrapped in fable. According to the most trustworthy tradition he was appointed Bishop of Antioch A.D. 69, and was thrown to wild beasts in the circus of Antioch by the command of Trajan, the date being given by some as A.D. 107, by others as A.D. 116. By the Greek Church his festival is celebrated on Dec. 20, by the Latin on Feb. 1. In the literature of the early Christian church Ignatius holds an important place as the reputed author of a number of epistles. These have come down to us in three forms. In the longest text they are 13 in number, but since the discovery of a shorter text containing only 7 the first has been universally recognized as in great part spurious, some of the letters entirely so, and others containing interpolations. But even in this shorter form their genuineness has been disputed by numerous scholars. Both of these texts are in Greek, but a still shorter text in the Syriac language, containing only three letters, exists. Some maintain that the Syriac text was the earliest, though not earlier than the middle of the second century. Others hold the genuineness of the shorter Greek text.

Ignatius, ST., Patriarch of Constantinople, son of the Emperor Michael I, was born about 798; died in 878. When his father was deposed he entered a monastery, assuming the name of Ignatius. In 846 he was raised to the patriarchate. He was opposed to the Iconoclasts, and his refusal to admit Bardas, brother of the Empress Theodora, as a communicant, on account of his reported immorality, led to his deposition in 857. The schism between the Greek and Roman Churches began while Photius, his successor, was in office, and has continued ever since. He was reinstated in 867, and at an ecumenical council assembled at Constantinople in 869 Photius and his party were condemned.

Ignatius Beans, ST., the seeds of a large climbing shrub (*Ignatiana philippinica*, or *Strychnos Ignatii*) of the nat. order Loganiaceæ, nearly allied to that which produces nux vomica, inhabiting the Philippines, and cultivated in Cochin China. The seeds contain a larger percentage of strychnia than the nux-vomica plant. It was so called by the Jesuits in honor of their founder, Ignatius Loyola.

Ignatius Loyola. See *Loyola* and *Jesuits*.

Igneous Rocks (ig'nē-us), in geology, rocks which are seen to owe their special character or

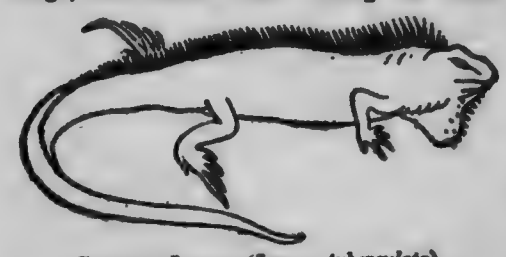
structure to their materials having been once in a state of fusion, as lava, basalt, granite, etc. Such rocks are not stratified, and may occur in connection with sedimentary rocks of any age, having usually been forced up from below.

Ignis Fatuus (ig'nis fat'ū-us; L. 'foolish fire'), a luminous appearance seen floating over marshy places at night, and sometimes, it is said, in churchyards. It is probably due to some gaseous mixture capable of igniting spontaneously, but it has never been satisfactorily explained, though methane is said to be the source. Also called *Will-o'-the-wisp*, *Jack-a-lantern*.

Ignorantines (ig-no-ran'tēns), a religious congregation of the Roman Catholic Church devoted to the gratuitous education of children. It was founded about 1683 by the Abbé de La Salle. The statutes of the order, approved by Benedict XIII in 1725, impose on its members vows of chastity, poverty, and obedience. In 1789 the order counted 1000 members, and possessed 121 houses. They were forced to quit France, but were recalled by Bonaparte in 1806. They are now to be met with in various countries. In France the law of 1882 banished them from the public schools.

Igualada (ē-gwä-lä'dä), a town in Spain, province of Barcelona, 36 miles W. N. W. of the town of Barcelona, on the Roya, with manufactures of cottons, woolens, etc. Pop. 10,442.

Iguana (i-gwa'na), a genus of lizards, the type of the family Iguanidæ, a native of Brazil, Guiana, and neighboring localities. It has an average length of about 4 feet. Its food consists almost entirely of fruits, fungi, and other vegetable substances. Its head is large, the mouth wide. Along the whole



Common Iguana (*Iguana tuberculata*).

length of the back to the tip of the tail there is a crest of elevated, compressed, pointed scales; the lower part of the head and neck is furnished with a dew-lap or throat-pouch. The toes are furnished with sharp claws, which enable it to climb trees with ease, while a rapid serpentine movement of its tail propels it swiftly through the water. Its usual color is dark olive-green. Its flesh is considered a delicacy, being tender and delicately-flavored, resembling that of a chicken. The eggs, of which the female lays from four to six dozen, are also eaten, having an excellent flavor. They are about the size of those of a pigeon, are laid in the sand, and hatched by the heat of the sun.

Iguanidæ (i-gwan'i-dē), a family of lizards of which the iguana is the type. They have the body rounded, sometimes laterally compressed and furnished with a ridge or serrated crest along the middle line of the back from snout to tip of tail, sometimes a throat-pouch or dew-lap present. See *Iguana*.

Iguanodon (i-gwan'u-don), an extinct fossil colossal lizard found in the Wealden strata; so called from the resemblance of its teeth to those of the iguana. The pelvic bones were strikingly like those of birds. The integument does not seem to have possessed the spines or bony plates of allied species. The anterior vertebræ were slightly amphicœlous, the posterior flat. The lower jaw was notched for the reception of the beak, as in the parrot. The teeth were large and broad, implanted in sockets, and transversely ridged. Mantell, its discoverer, estimated the length of the animal at from 60 to 70 feet, but Owen's calculation is 30 feet.

Ihlang-ihlang (ē'lang-ē'lang). See *Ilang-ilang*.

Ihre (ē're), JOHAN, a Swedish scholar, born in 1707; died in 1780. He became librarian at Upsala, where he obtained in 1737 the chair of literature and politics in the university. His most important work is called *Glossarium Suiogothicum* (a Swedish-Latin dictionary).

Iki (ē'ki), an island off the N. W. corner of Kiushiu, Japan, in Korea Strait. Gonoura is a small seaport on the S. W. of the island. Pop. about 36,000; area 87 square miles.

Ilang-Ilang (ē'lang-ē'lang; *Cananga odorata*), a large tree of the order Anonaceæ, cultivated in India and the Philippines, and yielding from its flowers a rich perfume.

Ildefonso, SAN (sän el-dā-fon'sō), a village of Spain, where is La Granja, a royal palace, built in a mountainous country by Philip V, in imitation of Versailles, 6 miles northeast of Segovia, 40 north by west of Madrid. The palace contains a great number of valuable paintings, statues, etc., and the gardens are magnificent.

Ile-de-France (ēl-dē-frāns), an old province of France,

having Paris as its capital, and now mostly comprised in the departments of Seine, Oise, and Seine-et-Oise.

Iletzk (ē-letz'), a town in the Russian Gov. of and 45 miles S. of Orenburg. Pop. 12,000. Close by is the richest salt-bed in Russia, yielding about 200,000 tons of salt annually.

Ilium (il'e-um), in anatomy, a name given to the lower three-fifths of the small intestines.

Ilex (I'leks), the genus to which the holly belongs; also a name for the evergreen oak or holm-oak. See *Holly* and *Holm-oak*.

Ilford (il'ford), a town of Essex, England, 7 miles E. N. E. from London by railroad. It has large photographic works and paper-mills. The chapel of the 12th-century Hospital of St. Mary is of archeological interest. Pop. (1911), 78,205.

Ilfracombe (il'frā-kōm), a market-town in England, Devonshire, on the Bristol Channel, 41 miles N. W. Exeter; very picturesquely situated. There is an inner and an outer harbor, and an active trade in coal, cattle, and agricultural produce with Welsh and Irish points. Ilfracombe is a bathing-place and health resort. Pop. 8935.

Ili (ē'yē), a river of Central Asia, partly in Chinese territory, but mostly in Russian. It is formed in Chinese Kuldja by two streams, the Tekes and Kunges, rising in the Thian-shan Mountains, and flows westwards, falling into Lake Balkash by several mouths after a course of 800 or 900 miles, half of which is navigable.

Iliad (il'i-ad). See *Homer*.

Iligan (ē-lē'gän), an inlet on the N. of Mindanao I., Philippines; also a pueblo of Misamis prov., Mindanao; the seat of a United States military station, harbor, and telegraph office. Pop. about 8500.

Ilion (il'i-on), a village of Herkimer County, New York, on the Mohawk River and Erie Canal, 2 miles W. of Herkimer. It has a large armory for the manufacture of rifles and pistols, and other industries. Pop. 6588.

Ilithyia (i-lith-i-ī'a), among the Greeks the goddess who assisted women in childbirth. In after-times she was identified with Artemis (Diana).

Ilium. See *Troy*.

Ilkeston (il'kes-tun), a market-town of Derbyshire, England, 9 miles S. E. N. E. of Derby, situated on a lofty hill. The church is a fine ancient edifice. Manufactures of hosiery and lace are here carried on to a great extent, and a number of the inhabitants are employed in mining coal and ironstone. Pop. (1911) 31,678.

Ilkley (ilk'li), a village of Yorkshire, England, 31 miles west of York, beautifully situated on the Wharfe, and much resorted to by visitants to the hydropathic establishments. Near Ilkley is the fine old ruin of Bolton Priory. Pop. (1911) 7902.

Illampu (ēl-yām-pō'). See *Sorata*.

Illapel (ēl-yā-pel'), a town of Chile, province Coquimbo. Pop. 8200.

Ille-et-Vilaine (ēl-e-vi-lān), a maritime department in the N. W. of France, lying between the English Channel and the department of Loire-Inférieure. It is watered mainly by the rivers from which it derives its name—the Vilaine, and its tributary, the Ille. Little more than one-half of the surface is arable. The cereal crops consist chiefly of wheat, meslin, rye and oats; other crops are buckwheat, hemp, tobacco, and flax. The minerals include iron, zinc, and lead. The principal manufactures are leather, sail-cloth, sacking, and coarse linens, and the coasting trade is active. Rennes is the capital; St. Malo the chief seaport. Pop. (1906) 611,805.

Illegitimacy (il-e-git'i-ma-si). See *Bastard*.

Illicium (il-li'si-um), a genus of eastern Asiatic and American evergreen deciduous shrubs, belonging to the nat. order Magnoliceæ. The plants of this genus are called aniseed-trees, from their fine aromatic scent. The fruit of *I. anisātum* (Chinese anise) is the star-anise of the shops (see *Anise*). *I. religiōsum* is a Japanese species, held sacred by the natives, who decorate the tombs of their dead with wreaths of it, and burn the fragrant bark as incense before their deities.

Illimani (il-yi-mä'nē), one of the loftiest peaks in the Bolivian Andes, fully 21,000 feet high, and covered with glaciers.

Illinois (il'i-noi or -nois), one of the North Central United States, bounded on the north by Wisconsin, east by Lake Michigan and Indiana, south-east by Kentucky, from which it is separated by the Ohio, and west by the Mississippi, separating it from Missouri and Iowa; greatest length, 370 miles; greatest breadth, 210; area, 56,665 square miles. The surface is somewhat hilly near the Ohio, and undulating towards the west; and a range of bluffs runs for a considerable distance along the margin

of the Mississippi; but with these exceptions the state is one continuous plain, with a gentle inclination towards the southwest. It has a greater proportion of arable land than any other state of the Union, the state standing centrally in the great prairie region, with its deep, rich soil. The only part of the state thickly wooded is the extreme south portion. The chief rivers are the Illinois, which traverses the state diagonally northeast to southwest, Rock, Kaskaskia, and Wabash. There are many smaller streams, and the state is very well watered. Indian corn and oats are the chief objects of cultivation, but wheat, hay, buckwheat, potatoes, turnips, cotton, hemp, flax, tobacco, castor-bean, etc., are also produced, and the cultivation of the vine is making considerable progress. Fruits are largely grown, including apples, peaches, plums, cherries, and the various berries; while potatoes, hops, tobacco, flax-seed, and broom-corn are among the other products. The common domestic animals are abundant, and immense numbers of swine are reared. Though chiefly an agricultural and manufacturing state, Illinois has important mineral resources. Bituminous coal abounds, and the state ranks next to Pennsylvania in coal product. Other minerals are limestone, pig iron, Portland cement, fluorspar, natural gas, etc. Copper lead and zinc are mined in small quantities, and there are quarries of marble and gypsum. Mineral springs are found in the southern part of the state. The rocks mostly are limestone, gypsum, and sandstone. The climate, although somewhat humid, is generally healthy. The commerce and manufactures have been largely developed of late years, and there is a greater development of railroads than in any other state. The Illinois and Michigan Canal connects Lake Michigan at Chicago with the Illinois at La Salle (distance 96 miles), and is of sufficient size and depth to permit vessels to pass from the lake to the Mississippi, though as yet used only as a drainage canal for Chicago. There is a well-organised school system. The University of Chicago is one of the best endowed and largely attended of American seats of learning, and Illinois University, at Urbana, is a well-equipped institution, with about 5000 students. There is also the Northwestern University, at Evanston, with a very large attendance. Springfield is the seat of government, and Chicago, on Lake Michigan, the principal commercial depot. Illinois was constituted a separate territory in 1809, and admitted as a State into the Union in 1818. Pop. (1910) 5,638,591.

Illinois, a river of the United States, formed by the union of the Kankakee and Des Plaines, in the N. E. part of the state of Illinois. It flows thence S. W., and falls into the Mississippi about 20 miles above the mouth of the Missouri. It is 500 miles long, half of it being navigable. A canal connects the river with Chicago.

Illuminated MSS. See *Manuscripts.*

Illuminati (i-lū-ma-nā'ti; the enlightened), a name given to members of several societies, especially to those of a secret society founded in 1776 by Adam Weishaupt, professor of law at Ingolstadt, Bavaria, for mutual assistance in attaining a higher degree of morality and virtue. It spread over Roman Catholic Germany, and contained in its most flourishing condition 2000 members, among whom were individuals of distinguished talents and high rank. The constitution and organization were taken partly from the Jesuits and partly from the Masons. Dissensions, however, arose and in 1784 it was dissolved by the Bavarian government. The members were also called Perfectibilists.

Illusion (i-lū'zhon). Much attention has been devoted by experimental psychologists during recent years to the phenomena of optical illusion by means of geometrical figures. No complete classification has been made of these, but the following classes contain the best known: 1. Illusions of Reversible Perspective. There are certain figures which are capable of two or more perspective interpretations. It is characteristic of these figures that as one looks at them the shift of perspective occurs spontaneously and at irregular intervals. An instance of this is seen in Figure 1, which may be seen either as a square block resting upon the ground or as a block projecting upwards and to the left from the plane of the paper. 2. Illusions of Extent. These fall into two classes: Constant and Variable. An instance of the latter is seen in Figure 2. Although the dimensions in these figures are objectively similar, the filled spaces appear larger than the open. 3. Illusions of Direction. These also may be constant or variable. An instance of the former class may be seen in Figure 3, which is known as Von Recklinghausen's illusion. If the figure is held a short distance from the eye and

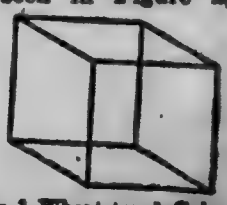


Fig. 1. Wheatstone's Cube.

its center steadily fixated, the hyperbolas become straight lines so that the figure resembles a chessboard. 4. Illusion of

Fig. 2. Helmholtz's Squares.

Association. These fall into two divisions, assimilative and contrastive, both of which may be produced by a series of rectangles according to the system of Müller-Lyer. 5. Mixed illusions. Produced by a combination of the preceding.

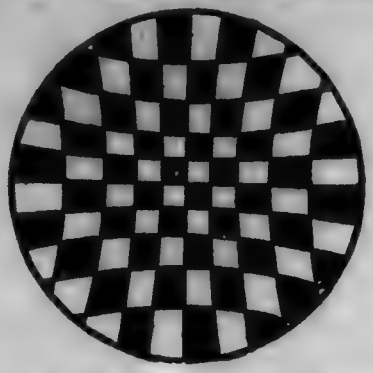


Fig. 3. Von Rentlinghausen's Illusion.

6. Illusions of Movement. There are various explanations of these results, but it may be that the interpretation must be drawn from the sciences both of physiology and psychology.

Illyria (il-lir'i-a), ILLYRICUM, a name formerly rather loosely applied to a large tract of country on the east side of the Adriatic, the ancient Illyrians being ancestors of the modern Albanians. Piracy was carried on by the Illyrians, whose kings were therefore embroiled in quarrels with the Romans, which ended in their subjugation in 228 B.C. They sought from time to time to shake off their chains, but being always beaten, the country at last became a Roman province. The name of Illyrian provinces was given, by a decree of Napoleon in 1809, to Carniola, Dalmatia, and other countries, then part of the French Empire. After the fall of Napoleon the Illyrian Provinces were restored to Austria, and designated as the Kingdom of Illyria, a title which the country bore till 1849, when it was divided into the provinces of Carinthia, Carniola, and the Coast-lands.

Ilmen (il'men), a lake in Russia, gov. of Novgorod, near its western borders; length about 33 miles, breadth 28. It receives numerous streams, and discharges itself by the Volkhov into Lake Ladoga. It abounds in fish. There is another lake of this name in Russia (also called Lake Manitch), on the frontiers of the governments of Caucasus and Don Cossacks.

Ilmenau (il'me-nou), a town of Central Germany, in the Grand-duchy of Saxe-Weimar-Eisenach, on the river Ilm. It has a grand-ducal castle, manufactures of porcelain, terra-cotta ware, etc., and a hydropathic establishment. Pop. 11,222.

Ilminster (il'min-stėr), a small but ancient market town of England, in Somersetshire, 17 miles south by east Bridgewater. Pop. 2467.

Ilorin (e-lo-rēn), a town in the Western Soudan, about 150 miles N. E. of the Bight of Benin in Nupe, a great center of trade; pop. est. 60,000 to 80,000, mostly Mohammedans.

Image (im'ij), in optics, the spectrum or appearance of an object made by reflection or refraction. It is by means of optical images that vision is effected, or that the telescope and microscope are of use. See the articles *Optics*, *Eye*, etc.

Image Worship. See *Iconolatry*.

Imaginary Quantity (i-maj'i-na-ri), in algebra, such quantity as $-a^2$ in the equation, $a^2 = -a^2$, when to find the value of a we should require to take the square root of $-a^2$; and this is impossible. Any algebraic expression containing $\sqrt{-1}$ is called an imaginary expression. The employment of imaginary quantities systematically has been the foundation of some of the greatest modern discoveries and improvements in geometry.

Imagination (i-maj-i-nā'shun), literally that faculty of the mind by which we can form mental *images* of things. Besides the power of preserving and recalling such conceptions, the imagination has the power to combine different conceptions, and thus create new images or mental pictures. It is this faculty which is more strictly termed imagination. In the creation of new images, or more properly in the combining of images which have previously been derived from objects of perception, the imagination operates according to the laws of the association of ideas. Its operations are nevertheless not wholly independent of the will, for by directing the attention to some leading thought, the

will can determine the limits within which the laws of association are to act, and by practice it can be fostered. Such free and yet regulated action of the imagination alone can give birth to the productions of the fine arts.

Imam (i-mäm'), a class of Mohammedan priests. In Turkey they attend in the mosques, call the people to prayer from the minarets, perform circumcision, etc. In ecclesiastical affairs they are independent, and are not subject to the mufti, though he is the supreme priest. They quit their office and reënter the lay order. The sultan, as chief of all ecclesiastical affairs, has the title of *imam*.

Imaus (i-mā'us), a name applied by the ancients sometimes to the Hindu Kush and the western part of the Himalayan range, and sometimes in a vague way to a range in Central Asia (supposed to be the Altaian Mountains), which they believed to divide the vast region to which they gave the name of Scythia, into two parts.

Imbecility (im-be-sil'i-ti), weakness of mind, such as puts a person considerably below the general run of mankind, but is not so great as to be called lunacy or idiocy, nor so well marked perhaps as to be classed under any one of the forms of insanity. Imbeciles sometimes display a considerable amount of intelligence in certain directions, and are often very cunning. They may be interesting, amusing, and even useful members of a community. Equity will not set a contract aside on the mere ground of imbecility; but its existence affords a material ingredient in examining whether it has been obtained fraudulently or by undue influence. In general the court is ready to support the obligation of any contract that a person of weak mind has entered into, unless it is of such a nature that a person of sound mind would not have agreed to it, or unless there is suspicion of fraud. An imbecile person may be summoned as a witness, but the degree of credibility attaching to his evidence naturally depends very much on the amount of intelligence he displays, and on the nature of the circumstances regarding which his evidence is offered.

Imber (im'bèr), Imber-goose, Ember-goose, a name sometimes given to the great northern diver.

Imbro (im'bro), or Imbros, an island of European Turkey, west from the entrance to the Dardanelles, 18 miles long and 8 broad. It is mountainous, well wooded, and intersected with richly-fertile valleys, producing wine, honey, oil, cotton, and lead. It has several villages. Pop. 1000, mostly Greeks.

Imeritia (i-mē-rish'i-a), or Imeretia, Russian district on the south of the Caucasus, now included in the government of Kutais. It formed part of the Kingdom of Georgia in the fourteenth century; became afterwards independent, and in 1804 it was voluntarily ceded to Russia by the last of its sovereigns.

Immaculate Conception. See *Conception* (*Immaculate*).

Immersion (im-ėr'shun), in astronomy, the disappearance of one heavenly body behind another or into its shadow. Immersion occurs at the beginning, and emergence at the end of an occultation or an eclipse.

Immigration (im-i-grā'shun), the entry of aliens to a country for purpose of settlement and permanent residence. This subject has been treated in its general aspects under the head of emigration (which see). But the subject of immigration has a particular application to the United States, the present great population of which, aside from its few Indians, is wholly the result of alien inflow, forcible on the part of its negro population, voluntary on that of the whites. And within the recent period this inflow of settlers has proceeded at a rate unprecedented in the history of any other country, the United States having become the great reservoir into which flows the excess population of Europe, and in a measure that of various other parts of the world. The earliest permanent settlements of immigrants within the area of the United States was at Jamestown in 1607, New York in 1613, and New England in 1620; other localities being successively settled during the seventeenth and eighteenth centuries. Most of the nations of Europe were represented in the inflow, though the numbers were small as compared with those of a later date, the total immigration up to 1820 being estimated at only 250,000 persons, much less than that of a single year at the present time. The inflow of Africans began in the slave ships of an early date, the first reaching Jamestown in 1620. We have no official record of the number of settlers reaching this country until the year 1817, when Congress provided for the making of returns in the several customs districts. In the year named 22,140 arrived, a much larger number than in previous years, and the abuses and suffering on shipboard were so great that Congress was obliged to provide remedies, an act to regulate the ocean transport of passengers being passed in

1819. Since that date collectors of customs have reported the numbers of immigrants arriving in their districts, with age, sex, occupation, and country of birth. The arrivals since then, counting by decades, have been: for the decade ending 1830, 143,149; 1840, 599,125; 1850, 1,713,225; 1860, 2,598,214; 1870, 2,314,824; 1880, 2,812,191; 1890, 5,246,613; 1900, 3,844,420, being a total in the period named of more than 20,000,000 new inhabitants. In the decade 1900-1910 the rate of immigration rapidly increased, passing the million mark in the successive years, 1905-07, and reaching in 1907 the grand total of 1,285,349; the total for the decade being nearly 9,000,000. As for the character of this immigration, it was mainly desirable until within recent years, when much of it became undesirable. In the earlier period Great Britain and Ireland, Germany and Scandinavia supplied the bulk of newcomers, but during the past few decades Southern and Eastern Europe have supplied much the greater number of immigrants, especially Italy, Austria-Hungary and Russia. Immigrants from Canada and Mexico were not counted prior to July 1, 1907, but the census of 1900 showed in this country 1,183,225 persons born in Canada, and 103,445 born in Mexico. Many of the immigrants reaching this country have been for various reasons undesirable, and this was generally the case with the Chinese, who after 1869, when a treaty was made admitting them, came in such numbers that in 1882 a bill was passed prohibiting the entrance of any new Chinese for ten years. In 1892 the law was continued for a second ten years, and the policy of exclusion still holds good. At a later period Japanese laborers began to arrive in large numbers, and the opposition to them became so great that in 1907 acts were passed prohibiting the entrance of any Japanese and Corean laborers. Great numbers of the European immigrants have also proved undesirable for various reasons, such as ignorance, unhealthfulness, criminal record, lack of means of support, etc., and several restrictive measures have been passed; as yet not sufficient to satisfy the demand of the people. One great source of dissatisfaction is the tendency of immigrants to settle in the great cities and their vicinity, overfilling these already congested centers of labor, and to avoid seeking the agricultural districts, where they could be usefully employed. A bureau of information to aid in the latter purpose was established in 1907, its object being the beneficial distribution of aliens among the States and Territories desiring them. This has proved very useful in advising immigrants where they can find profitable employment and has resulted in a better distribution. A commission was appointed for the study of immigration problems at home and abroad. It published a number of reports, the most important being in relation to the white slave traffic. The demand that immigration to the United States should be restricted to those able to read and write in English or in their own language had often been made, and on three separate occasions bills to this effect had been passed by Congress, to be vetoed by the President on each occasion. A fourth bill of this kind was passed in the early session of 1917 and this also was vetoed, but on this occasion it was passed over the President and became the law of the land. Except under a few specified conditions all immigrants must be able to pass this literary test. During the European war (*q. v.*) immigration to the United States was almost entirely cut off.

Immortality (im-or-tal'i-ti), exemption from death; the state of everlasting life. The dogma of the immortality of the soul is very ancient. It is connected with almost all religions, though under an infinite variety of conceptions. By the immortality of the soul we understand the endless continuation of our personality, our consciousness, and will. There are so many reasons to render immortality probable, that with most nations the belief is as clear and firm as the belief in God; in fact the two dogmas are intimately connected in the minds of most men. The hope of immortality must be considered a religious conviction. Reason and religion command man to strive for continued perfection. This duty man cannot relinquish without abandoning at the same time his whole dignity as a reasonable being and a free agent. He must, therefore, expect that a continuation of his better part, as the necessary condition for his progress in perfection, will not be denied to him. Hence the belief in immortality becomes intimately connected with our belief in the existence and goodness of God. Among rude peoples the life after death is usually regarded as a state of being not essentially different from the present—one in which the hunter shall renew his chase, and his corporeal senses shall have their accustomed gratifications. Among the ancient Greeks and Romans the spirits of the dead were believed to live in the other world as a sort of shadows, and the life after death was also considered as

shadow of the present. Among some peoples the imagination attributes changes of condition to the future life, and the doctrine of transmigration, or the progress of the mind or soul in different stages, is developed. Connected with the belief in the immortality of the soul is the belief in a state where souls are purified after death, which existed among the Egyptians and exists among many Christians. See *Purgatory*.

Imola (ē'mō-lä), a town of Italy in the province of Bologna, on an island in the Santerno, 22 miles S. E. of Bologna. Pop. (1910) 38,369.

Impact (im'pakt), in its simplest aspects refers to the laws of collision of bodies. When a moving body impinges on another body, the bodies may adhere to one another, but usually those portions of the bodies near which the collision takes place are compressed and then regain their original form, thus causing the bodies to rebound from one another. Sometimes, however, the impact may produce a shattering or a permanent deformation of the impinging bodies. Generally part, at least, of the kinetic energy of the bodies is transformed into other forms of energy, such as light and heat. New stars probably arise from the collision of cosmic masses. Taking the simple case in which two spheres moving in the line joining their centers come into collision, there is no total change of momentum, and the relative velocity of the spheres after impact is e times their relative velocity before impact, e being the co-efficient of restitution. If the colliding spheres are rotating, as is usually the case with billiard balls, or if they collide obliquely, friction comes into play, and the problem is more involved. When a stream of fluid impinges on a solid surface in motion, its velocity during impact relatively to the surface remains unchanged in magnitude.

Impanation. See *Consubstantiation*.

Impatiens (im-pā'shi-ens), a genus of annual or biennial herbs. One species, *I. noli-me-tangere*, or touch-me-not, is a succulent herb with yellow flowers. *I. balsamina* is the garden balsam.

Impeachment (im-pēch'ment), an accusation and prosecution for a crime or misdemeanor, in which the House of Representatives are the prosecutors and the Senate the body of judges. In Britain the House of Commons are the prosecutors, and the House of Lords the judges. The necessity of some tribunal distinct from the ordinary courts, for the trial of certain offences, or for any high misdemeanor in certain officers, is apparent, since the judges of the highest courts cannot in all cases safely be intrusted with the trial of each other. The most noted case of impeachment in this country was that of President Andrew Johnson, in 1868, he being charged chiefly with violation of the Constitution and the Tenure of Office Act. This memorable trial lasted three months, on each vote taken the Senate standing 35 for conviction and 19 for acquittal. As a two-thirds vote is necessary for conviction, the impeachment failed by one vote. In England impeachment is a rare event, the last instance being the trial of Lord Melville, in 1805. A majority vote there is sufficient for conviction, but the crown may pardon the offender. Any civil officer may be impeached.

Impenetrability (im-pen-e-tra-bil'i-ti), in physics, that property of matter which prevents two bodies from occupying the same space at the same time; or that property of matter by which it excludes all other matter from the space it occupies.

Impennes (im-pen'nēz), a name given to swimming birds with small wings which have only rudimentary feathers, as the penguins.

Imperator (im-pe-rā'tur), among the ancient Romans, a term originally applied to a military commander, one who held the *imperium*, or military power. In later times no one received this title who had not defeated a hostile force of at least 10,000 men. After the overthrow of the republic *imperator* became the highest title of the supreme ruler, and acquired the signification which we attach to the word *emperor*. It was still given, however, to triumphant generals, and, in this case, has its old signification. The emperors appear to have used it because they were considered as superior to all the generals. See *Emperor*.

Imperial (im-pē'ri-al), pertaining to an emperor or empire; thus, an *imperial* crown is such as is worn by the German emperor; the *Imperial* parliament is that of the United Kingdom. —A size of paper, measuring 30 in. by 22, is also called *imperial*.

Imperial Chamber. See *Chamber*.

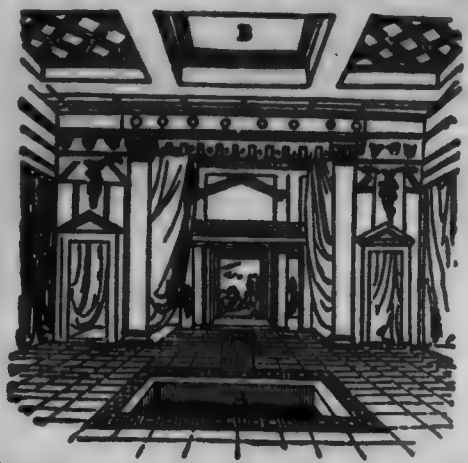
Impetigo (im-pe-tī'gō), a skin disease consisting in an eruption of itching pustules, appearing in clusters, and terminating in a yellow, thin, scaly crust. It occurs most frequently on the extremities.

Impey Pheasant (im-pē; *Lophophorus refulgens* or *Impeyanus*), a bird of the pheasant family (Phasianidæ) remarkable for the splendid colors and metallic luster of the

plumage of the male, whence it is called in India (of which it is a native) *mo-naul*, meaning bird of gold. It is found in the high and cold regions of the Himalaya, and is of the size of a small turkey. It obtained the name of Impey pheasant from the fact that Lady Impey was the first who attempted (unsuccessfully) to introduce the bird alive into Europe.

Implacentalia (im-pla-sen-tal'i-a), the aplacental mammals. See *Aplacental*.

Impluvium (im-plū'vi-um; Lat. *in*, into, *pluto*, to rain), in ancient architecture, a term which denoted in the houses of the ancient Romans a basin in the middle of the atrium or entrance-hall, below the *compluvium* or open space in the roof, to receive the rain. See *Atrium*.



Roman Atrium.—A, Impluvium; B, Compluvium.

Impoon (im-pön'), a kind of antelope, Duykerbok (which see).

Impost (im'post), (1) a tax, tribute, or duty, particularly a duty or tax laid by government on goods imported. (2) In architecture, the point of junction between an arch and the column, pier, or wall on which it rests. It is often marked by horizontal mouldings, though these may be absent. Imposts have received various names, according to their character. Thus, a *continuous impost* is where the mouldings are carried down the pier; a *discontinuous impost* where there are no mouldings, but the pier is of a different section from the arch; *shafted imposts* are where the arch mouldings spring from a capital and differ from those of the pier.

Imposts.

1, Continuous. 2, Discontinuous. 3, Shafted.

Impounding-Cattle. See *Pound*.

Impressionism (im-pres'yun-ism), the term applied to a modern school of art, which originated in France and has spread to other countries. The work of the impressionists was first exhibited in 1867 and is now to be seen in every exhibition of art work. The aim of the impressionists is to get rid of artistic tradition and to look at nature from an original standpoint. This was also the aim of the pre-Raphaelites, but the impressionists differ from the latter in portraying only the salient features of nature visible in cursory examination and rendering these by brushwork of the thinnest and loosest description. In the work of some of them little care for beauty of color, form, or expression is visible, and the extremists of this school produce work the reverse of attractive.

Impressment of Seamen (impres'ment), the act of compelling persons, especially seafaring men, to serve in the navy. The power of impressing seamen, formerly a common practice in England, though still existing, has fallen into abeyance since the conclusion of the general war in 1815. Impressment was of ancient date, and uniformly practised throughout a long series of years. It has never been adopted in the United States.

Imprimatur (im-pri-mā'tur; Latin, 'let it be printed'), the word by which the licenser allows a book to be printed in countries where the censorship of books is exercised in its rigor. See *Books, Censorship of*.

Imprisonment (im-priz'n-ment), the restraint of a person's liberty, whether in a prison, the stocks, or by merely keeping in custody. It is usually inflicted by way of punishment, the power of sentencing to imprisonment being conferred on certain courts or magistrates, and strictly limited by law. A person may be imprisoned, however, who is merely accused of a crime, in which case he can demand to be released on bail. Imprisonment for ordinary debt is now practically abolished in Great Britain and the United States.

Impropriation (im-prō-pri-ā'shun), in the English Church, the transfer of a benefice to the possession of a layman, the annexing of benefices to ecclesiastical corporations being called *appropriation*, though they are sometimes identical. Appropriations were originally annexed to bishoprics, prebends, religious houses, etc.; but on the dissolution of the monasteries in the reign of Henry VIII the appropriations of the several benefices belonging to them were given to the king, and were afterwards granted out from time to time by the crown. It was after this time that the term *impropriation* was introduced to denote a benefice in the hands of a layman. The appropriator deputed some person to perform divine service in such parish, who, being merely his deputy or vicegerent, was called *vicar*, and his stipend was at the discretion of the appropriator. The distinction therefore of a parson and vicar is that the former is entitled to all the ecclesiastical dues of his parish, while the vicar is in effect only the curate of the real parson (the appropriator), and receives but a part of the proceeds.

Improvvisatori (im-prov-iz-a-tō'rē), the name given in Italy to persons who compose and declaim extemporaneously a poem on any given subject, or sing it, accompanying their voice with an instrument. This has long been a practice in Italy, and many of the *improvvisatori* have acquired considerable celebrity. The poet Metastasio at a very early period showed an extraordinary talent for this kind of composition, but the exercise of it cost so much effort that from a regard to his health he was obliged to give it up. Even at the present day Italy abounds in this class of poetical composers. The printed works of the improvvisatori who have been most admired have never passed mediocrity, and it is probable we should not have had such beautiful poems from Metastasio if he had not been obliged to renounce extemporaneous poetry.

Imputation (im-pū-tā'shun), as a term in Christian theology, is used to signify, on the one hand, the reckoning of the sins of man to Christ, and, on the other hand, the reckoning of the righteousness of Christ to believers.

Ina (I'na), or INE, king of the West Saxons in the seventh and eighth centuries. He succeeded Ceadwalla about 689, and after having obtained advantages over the people of Kent in 694 he turned his arms against the Britons, from whom he wrested Somersetshire and other parts of the west of England. He then made war on the Jutes; but the contest was terminated without much advantage to either party, by a bloody battle in 715. He resigned his crown and went as a pilgrim to Rome (728), where he passed the rest of his days in devotion. He was one of the principal legislators of the Anglo-Saxons. His laws are the oldest known to us among the Anglo-Saxon kings, except those of the kings of Kent, and served as the foundation of the code formed by Alfred the Great.

Inagua (ē-nä'gwa), GREAT and LITTLE, two islands, the former about 40 miles from the eastern extremity of Cuba, low and intersected with lagoons, and affording good pasture land; area, 660 sq. miles; pop. 1500. Little Inagua is quite small.

Inaja Palm (in-a-ja'; *Maximiliana regia*), a South American palm growing to the height of over 100 feet, with leaves 30 to 50 feet long. The spathes are so hard and woody as to serve for cooking food on the fire: they are also used as baskets, etc. The fruit is edible.

Inarching (in-ärch'ing), the same as grafting by approach. See *Grafting*.

Inca (in'ka), or INCA, a word signifying 'chief,' which the natives of Peru gave to their kings and princes of the blood before the Spanish conquest. See *Peru*.

Incandescent Light (in-kan-des'ent). See *Gas* and *Electricity*.

Incantation (in-kan-tā'shun), a certain formula of words, supposed to have some magical effect, especially if uttered with the accompaniment of certain ceremonies. Incantations are still common as a part of popular medicine among the uneducated in many countries.

Incarnation (in-kär-nā'shun; Lat. *in*, and *caro*, *carnis*, flesh), a word used to express the manifestation of the Deity in the flesh under the human form; thus we speak of the *incarnation* of Christ. The Hindus believe in innumerable incarnations of their deities. The most celebrated of these in Hindustan are the nine incarnations of Vishnu. See *Avatar*.

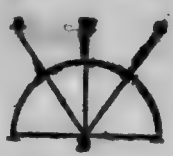
Incense (in'sens), aromatic substances burned in religious rites on account of the sweet odor they emit. The custom of burning incense is ancient and widely spread. Among the Jews the practice was enjoined as part of the worship of the sanctuary (EX., XXX, 27), the ingredients of the incense also

being laid down, and it was to be burned on a special altar called the *altar of incense*. This altar was made of acacia (shittim) wood, and was overlaid with gold, hence it was also called the *golden altar*, as distinguished from the altar of burnt-offering, which was made of brass. The incense was burned daily—morning and evening. In ancient Egypt, Assyria, Babylonia, India, Greece, and Rome incense-burning was part of the worship of the gods, and it is still employed as part of the Buddhist ceremonial. Both the Greek and the Latin churches use incense in worship, but the practice probably did not arise until the fifth century.

Incest (in'sest), sexual intercourse within the prohibited degrees. From a very early period it has been under the ban of the church, and in early European history was punishable by the civil courts as well. In England, incest was at one time a capital offence, but the punishment of it was afterward left to the spiritual courts, and for some time it was not a crime. The Punishment of Incest Act (1908) made carnal knowledge of a man's mother, sister, daughter, or granddaughter, whether legitimate or illegitimate, a misdemeanor. In the United States, incest is a punishable crime; but the degrees within which marriage is permissible are regulated by the statutes of the various states.

Inchcolm (insh-kōm'), a small island of Scotland, in the Firth of Forth, off the coast of Fifeshire, with the ruins of a monastery founded by Alexander I in 1123, of which Walter Bower, the continuator of Fordun, was abbot from 1418 till 1449.

Inchkeith (insh-kēth'), a small island of Scotland, in the Firth of Forth, off the Fifeshire coast, containing a lighthouse.



Incidence ANGLE OF, (in'si-dens), the angle which a ray of light falling on a reflecting or refracting surface makes with the perpendicular or normal to the surface. The angle of incidence, A B H, is always equal to the angle of *reflection*, H B C.

Inclination, MAGNETIC, or MAGNETIC DIP. See *Dipping Needle.*

Inclination Compass, same as *Dipping Needle.*

Inclined Plane (in-klīnd'), a plane forming with the horizontal plane any angle whatever excepting a right angle. It is one of the mechanical powers by which a small force under certain conditions is used to overcome a greater force. When a body lies on an inclined plane part of its weight is supported, so that if a cord be fastened to it and pulled, a force less than the weight of the body acting in a direction parallel to the plane will prevent it from sliding, or will move it up the plane. Thus a heavy wagon is raised on an inclined road by a horse which would be quite unable to exert a pull equal to a quarter of the weight of the wagon. Neglecting friction, the force parallel to the plane necessary to raise the body is equal to the weight of the body multiplied by the vertical height through which it is lifted, divided by the distance it is moved along the plane.

In Cœna Domini (in sē'na dom'i-nī), a papal bull, so called from its first words, it being annually read 'at the Lord's Supper' on Holy Thursday. Its earliest form was that promulgated in 1363 by Urban V anathematizing all heretics and favorers of heretics without distinction. The bull was afterwards extended and modified by several popes to include those who imposed taxes upon the clergy for the needs of the state, and in its latest form (promulgated by Urban VIII in 1627) specially anathematized all Hussites, Wickliffites, Lutherans, Calvinists, Unitarians, etc.; all schismatics, pirates who disturbed the papal seas, forgers of papal letters; all who should attack or conquer the papal territory, etc. The bull was annually promulgated at Rome till the year 1770, when a much modified document took its place, this in its turn being withdrawn by Pius IX in 1869.

Incombustible Cloth (in-kom-bus'-ti-bl), cloth rendered uninflammable by artificial means. This may be done by steeping the fabric in borax, phosphate of soda or ammonia, alum or sal-ammoniac; but these salts are not suitable for fine fabrics, and that which has been found to answer the purpose most effectually is tungstate of soda. A solution containing 20 per cent. of this salt, along with 3 per cent. of phosphate of soda, renders a fabric perfectly non-inflammable, and does not interfere with the ironing.

Income Tax, a tax levied directly from income of every description, whether derived from land, capital, or industry. A tax of this kind was first imposed in Great Britain, in January, 1799, during the ministry of Mr. Pitt. It is still retained and a considerable part of the revenue of that king-

dom is derived from it. At present a tax of 10 d. per pound is levied on all incomes above £150, with a reduction allowed on those under £400. A tax of this kind existed in the United States (1861-70), imposed to aid in raising revenue during the Civil war. At first it was fixed at 3 per cent, but in 1865 was increased to 5 per cent, and the tax on all incomes over $10,000 was fixed at 10 per cent on the excess over $5000. It was repealed in 1870, the total sum raised in the ten years being nearly $365,000,000. A similar tax was enacted in 1894, but was ineffective, being declared unconstitutional by the Supreme Court. In 1909 a resolution was adopted by Congress providing for an amendment to the Constitution legalising an income tax. This was finally ratified in 1913. The tax was one per cent on all incomes of over $3000 (or over $4000 for married men). The rate was raised from one to two per cent in 1916 and a graduated super tax added on all incomes over $20,000. These Federal Taxes are in addition to all state income taxes.

By an Act of Congress, approved October 3, 1917, further additional taxes were imposed on incomes, a normal tax of two per cent. and a super tax of one per cent. on the excess over $5000 and not above $7500, two per cent. on that over $7500 and not exceeding $10,000. The same progressive rate of increase continues up to incomes of $15,000; it is five per cent. for excesses between $15,000 and $20,000, seven per cent. between $20,000 and $40,000, and ten per cent. on the excess over $40,000 and not over $60,000. Beyond this sum the graduated scale is raised till fifty per cent. is levied on the excess of incomes over $1,000,000. The exemptions provided by the Act of 1916 were reduced from $3000 for a single person and $4000 for a married person to $1000 and $2000 respectively. The effect of this legislation is that on an income of $3000, a married person is assessable for two per cent. normal tax or $20.00; on one of $5000, the normal tax of two per cent. provided by the 1916 Act, or $20, in respect of the exemption of $4000 allowed therein, and a further $60 for the normal additional tax under the 1917 law, based upon an exemption of $2,000, making a total of $80 for the calendar year 1917. An income not exceeding $7500 is subject to a total tax of $205, representing two per cent. on $3500, being the excess beyond the exemption, as levied by the Act of 1916 as normal tax, an additional two per cent. as normal tax on $5500, representing the excess income over the exemption allowed by the Act of 1917, and a super tax of one per cent. on the excess of income over $5000. There are, it will be seen, two separate and distinct Income Tax laws in operation. By the War Income Tax Bill of 1917, there is also provided a tax on the incomes of corporations and individuals except those, in general terms, not associated for the purpose of making profits. The rate of such profits taxes are from twenty per cent. of the excess net income up to sixty per cent., by graduated percentages based on the relation of the amount of net income in excess of given percentages of invested capital. Thus the tax rate is 20% on the income not in excess of 15% of the invested capital for the taxable year; 25% where the net income exceeds 15% and is not in excess of 20% of such capital; 35% where above 20% and not exceeding 25%; 45% where exceeding 25% and not above 33% and 60% of the amount of the net income in excess of 33% of the capital. Deductions are allowed of $3000 in respect of corporations and $6000 in the case of individuals. It is also provided that where there is only a nominal capital or none invested, a specific tax of 80% is levied on the net income after the deduction above mentioned. See *War Revenue*.

Incommensurable (in-kom-en'sū-ra-bl), in mathematics, a term applied to two magnitudes when they cannot both be measured by the same quantity, that is, when they do not contain it one or more times exactly, as the diagonal and side of a square.

Inconnu (Fr. unknown), a fish, usually called the Mackensie River salmon, which in zoological character appears intermediate between the whitefish and the salmon. Its weight is usually about ten pounds, though much larger specimens at times occur. It was discovered by Alexander Mackenzie and named by his followers. As it is found in all the American and Asian rivers of the Arctic region it is of much importance to the natives of this section, despite the fact of its being an oily fish.

Increment (in'kre-ment), UNEARNED. This phrase first came into use in the Henry George system of land tax, in which it is claimed that much unimproved land is to be found in cities which has increased greatly in value as a result of improvements on surrounding land. This extra value is spoken of as the unearned increment, and it is claimed that it should be made subject to taxation sufficient to force the owners to improve their land. The phrase came in use again in 1909 as a feature of the Lloyd George budget of British taxation. He claimed that portions of the many landed estates of Britain had gained a large unearned increment of value through surrounding

improvements, and that this paid a very inadequate rate of taxation. His effort to tax this land at its true value met with vigorous opposition in the House of Lords, but the Lords were in the end obliged to pass the bill.

Incroyables (Fr. *Incredibles*). A name which, under the French Directory, was applied to a class of Parisian dandies, who made themselves conspicuous and to some extent ridiculous by their extravagances in dress, manner and speech. Among their peculiarities was the omission of the *r* sound in speaking. Their name was taken from their favorite expression, *Ma petite pa'ole d'honneu', c'est inc'oyable.* (Me wohd of honnah, it's incwedible.) This type of affectation has been known in France by various other names. The term has also been applied to the exaggerated style of hats which they wore.

Incubation (in-kū-bā'shun), in pathology the period between the introduction of the morbific principle and the outbreak of the disease. It is then gathering head in the system, and indicated only by such general symptoms as loss of appetite or sleep, etc. In epidemic and contagious diseases the period of incubation is well defined.

Incubation, the mode in which birds commonly bring forth their young, that of sitting on the eggs till they are hatched by the natural heat of the body. In general it is the female which undergoes the labor of incubation, but among some species, chiefly of monogamous birds, the male relieves the female while she seeks her nourishment; in others the male feeds her. Some birds, like the cuckoo, abandon their eggs to be hatched by others. In a state of nature birds generally commence to sit in spring. The time of incubation varies with different species, but is always the same with the same species. In the hummingbirds it is 12 to 14 days; in the swallow and lark, 15; the canary, from 15 to 18; crow, 20; common hen, 21; pheasant, partridge, etc., 22; peacock and turkey, 30; swan, 40-45; cassowary, 62.—*Artificial incubation*, the hatching of eggs by prolonged artificial warmth, has been long practised among the Egyptians and Chinese. Attempts have been made to carry out the artificial system on a considerable scale, both in America and England, and with remarkable success.

Incubator. The art of hatching eggs by artificial means was known to the Egyptians and Chinese at a very remote period. Brick ovens, heated with horse or camel dung, were used during four months of the year, while the annual product has been estimated at 75,000,000 chicks. Within recent times much improved methods have been devised, various ways of maintaining the requisite temperature being employed. The latest American incubators employ hot air. The advantages of hatching by artificial means are many, and a much larger number of chicks can be raised with much less care than where the hatching is done by hens.

Incubus (in'kū-bus), a spirit or demon, to whom was formerly ascribed the oppression known by the name of *nightmare*. These demons play a somewhat important part in the superstitions of the middle ages.

Incumbrance (in-kum'brans), any right or interest in land which may be held by third persons which diminishes the value of but not the right to pass title to such land. Examples of legal incumbrances are unpaid taxes, leases, mortgages, easements, mechanics' liens, private right of way, and so forth. The vendor of real estate is bound to disclose incumbrances and to deliver to the purchaser the instruments by which they were created or on which the defects arise. Failure to specify incumbrances, if such exist, gives the purchaser the right to reject the title and sue for damages. "Covenants for title" are covenants inserted in conveyances attesting that there are no incumbrances except such as may be specified.

Incunabula (in-kū-nab'ū-la), a term applied by bibliographers to editions of books printed during the early period of the art. It is generally limited to works which appeared previous to 1500.

Indemnity (in-dem'ni-ti), a term frequently employed in politics and jurisprudence. It is used in various significations, but is usually applied to an act of the legislature passed for the purpose of relieving individuals, especially in an official position, from the penalties to which they may have rendered themselves liable by some violation of the law whether by act or omission, or in case of members of government in consequence of exceeding the limits of their strict constitutional powers.

Indenture (in-den'tūr), a deed entered into between two or more parties, and so called because duplicates of every deed between two or more parties were once written on one skin, which was cut in half, with a jagged or indented edge, so that they were seen to belong to one another. See also *Apprentice.*

Independence (in-dē-pen'dens), a city, capital of Montgomery county, Kansas, on the Verdégris River, 36 miles from Humboldt. It

is in a fertile country and is an agricultural trade center. The manufactures include cotton, paper, bricks, tiles, flour, etc. It lies in a coal, petroleum and natural gas district. Pop. 10,480.

Independence, a city, capital of Jackson County, Missouri, 3 miles E. of Kansas City, Mo., and 4 miles S. of the Missouri River. It has fruit growing, canning, and stock-raising industries and various manufactures. Pop. 12,000.

Independence Day, a holiday held in the United States on the 4th of July, this being the day in 1776 in which the Declaration of Independence was adopted by Congress.

Independence Hall, the old State House of Pennsylvania, built on Chestnut Street, Philadelphia, 1732–41, and occupied by the Congress of the new republic when independence was declared, July 4, 1776. It is now regarded as the Mecca of American patriotism. It is a fine example of colonial architecture and has recently been restored to its original condition. In it is kept as a sacred relic the famous Liberty Bell, with its significant motto, 'Proclaim liberty throughout all the land to all the inhabitants thereof.' It contains numerous historical portraits.

Indeterminate (in-de-tėr'min-āt), in mathematics, having an indefinite number of values or solutions. *Indeterminate analysis* is a branch of algebra in which there are always given a greater number of unknown quantities than there are independent equations, by which means the number of solutions is indefinite.

Index Librorum Prohibitorum ('list of prohibited books'), in the Roman Catholic Church, a title used to designate the catalogue or list of books prohibited by ecclesiastical authority, on account of the heretical opinions supposed to be contained in them, or maintained by the authors or editors of them; when the list or catalogue is of books allowed to be read after correction or alteration, agreeably to the orders of the Papal authorities, it is termed *Index Expurgatorius.* Such prohibitory catalogues have been in use from a very early period in the history of the church, commencing with a list of prohibited books drawn up by a council held at Rome in 494, or even earlier with the proscription of the writings of Arius. These prohibitions, in fact, were often issued by other than the Papal authorities. In 1408 a synod at London prohibited the reading of the books of Wickliffe. In 1544 the Faculty of Theology in Paris published a catalogue of books censured by them, and in 1546 the University of Louvain published an index of books regarded as dangerous. The indexes of the church were a subject of consideration at the Council of Trent, which referred the business of drawing up a complete index to a select committee under the pope. Their Index was published in 1564, and besides the catalogue of prohibited books contains general rules relative to such books. In 1586 a special ecclesiastical board, the Congregation of the Index, was formed, consisting of a cardinal-prefect, with other cardinals and examiners of books, with authority to judge of new works, to indicate those of which the reading is entirely prohibited, and those which are permitted after correction, and also to grant to learned and pious men the right of reading prohibited works. The most important editions are those of Alexander VII in 1664, and of Benedict XIV in 1758. The latest edition appeared in 1900, according to rules of 1897. In 1607 the first volume of an Index Expurgatorius was published at Rome, edited by the Dominican Brasichelli. In Spain the Inquisition maintained its right to issue its own index, the last edition of which, dated 1790, was reprinted, with a supplement in 1805. The Spanish indexes are mostly both prohibitorial and expurgatorial.

Index Expurgatorius. See preceding article.

India (in'di-a), a name properly applicable to the whole of the British Indian Empire, which includes Burmah (which see), but popularly restricted to the great central peninsula of Southern Asia. It forms an irregular triangle, insulated from the rest of Asia by the almost impassable ranges of the Himalayas, the Hindu-Kush, and Suleiman Mountains, and by the Indian Ocean. Its length north and south, and its greatest breadth east and west, are both about 1900 miles. Within these borders is an area of about 1,773,168 sq. miles, with a population (1911) of 315,156,396. India may be regarded as consisting of three separate regions, well defined by differences of soil, climate, productions, and population. The first is the region of the Himalayas. Immediately south of the Himalayas lies the vast North Indian Plain, containing the most fertile and densely-populated portions of the empire. South of the northern plain rises the third region of India, the triangular plateau of the Deccan, which has a general elevation of from 2000 to 3000 feet. Its northern scarp is formed by a number of hill ranges known as the Vindhya

Mountains. The other two sides of the Deccan are formed by the Eastern and Western Ghâts, which stretch southwards along the eastern and western coasts of India, the latter rising in the Nilghiris or Neilgherries to the height of 8760 feet. (See *Ghâts.*) The vast North Indian plain is watered by three distinct river systems, which collect the drainage of both the northern and southern slopes of the Himalayas. The first of these systems rises on the northern side of the Himalayas, and makes way through their western ranges into the Punjab as the Indus and Sutlej. The second rises in the same quarter, not far from the sources of the Indus and Sutlej, but flows in an opposite direction, and enters India on the east as the Brahmaputra of Assam and Eastern Bengal. As these two systems convey to India the drainage of the Tibetan slopes of the Himalayas, so the third system, the Ganges, with its tributary the Jumna, drains the southern slopes; traverses the central part of the Indian plain; unites near its mouth with the Brahamaputra and forms the immense delta known as the Sunderbunds. The Ganges for thousands of years has occupied a prominent place in Indian civilization, and was the sole channel of traffic between Upper India and the seaboard until the opening of the railway system in 1855. In the Deccan the Nerbudda and Tapti carry the drainage of the southern slopes of the Vindhyas into the Gulf of Cambay; and the Godavari, the Kistna (Krishna), and Cauvery rise in the Western Ghâts, and traverse the whole of the central table-land, reaching the sea on the eastern shores of the peninsula. The Indian rivers in the lower portions of their courses afford a natural system of irrigation, but in the higher parts an extensive system of canal irrigation is required. The Ganges and Jumna canals alone irrigate an aggregate area of about three million acres. The coasts of India have very few indentations, and consequently few good natural harbors. There are no lakes of any extent, Chilka and Kolair on the east coast being the largest.

Climate.—In Southern India the climate, of course, is tropical, and generally the heat is very great. Among the higher elevations of the Himalayas an Alpine climate prevails. The Indian plains are, especially in summer, sultry, unhealthy, and partly barren. The Deccan and the slopes of the Himalayas enjoy a temperate climate. The climate of the Nilghiris is healthy and pleasant, and several sanatoria for Europeans have been established there, as well as on the Himalayas. Throughout the entire country there are only two annual seasons, the dry season and the rainy season. The rainfall depends upon the monsoons. On the western coast the rainy season begins with the southwest monsoon, and lasts from May till November; on the east coast the rainy season, following the southeast monsoon, lasts from November till March. The rainfall, however, is distributed with great irregularity.

Botany and Zoology.—The flora of India offers nothing very distinctive. In the Himalayas it has to a considerable extent a European character; in the south it is tropical. Many plants of temperate climates, such as wheat, barley, European vegetables, etc., are grown in the northwestern and other parts, while various products of warmer regions are also cultivated, such as cotton, rice, indigo, oil-seeds, jute, tobacco, sugar-cane, cocoanut, date and other palms, spices, etc. Coffee, tea, and cinchona, though of recent introduction, are now extensively cultivated in India, the first particularly on the slopes of the Western Ghâts and in the Nilghiris. The tea-plant is also grown in the south, but especially in Assam and along the lower slopes of the Himalayas. European fruits abound, and among cultivated fruits may be mentioned the mango, plantain, pomegranate, citron, orange, lime, melon, fig, almond, pineapple, guava, jack, and tamarind. Among trees the teak forests under the protection of the government are of most economic value. The bamboo, the banyan, the sappan, the saul, etc., are all characteristic of Indian forest scenery. In Bengal and some other parts the natives live chiefly on rice, but millet is the staple food, grain, barley, wheat, with sweet potatoes, onions, garlic, etc., being also largely found. Opium is cultivated in Bahar, Benares, and Malwa. The vast forests of India are tenanted by great numbers of wild animals, birds, and reptiles. Large herds of elephants are still met with in Nepaul, Eastern Bengal, and the Nilghiris; the bear, the wild boar, and rhinoceros chiefly in the woods of the Eastern Himalayas; the tiger is found in every part of the country; the lion is now almost extinct. Other carnivorous mammals are the leopard or panther, cheetah, wolf, fox, jackal, and hyena. Several antelopes and deer, wild sheep and goats, the wild ass, the great gaur ox or 'bison,' the wild buffalo, are among the fauna. Snakes and reptiles in all varieties are very numerous, and the cobra and other poisonous snakes cause numerous deaths. Among domestic animals are oxen, camels, horses, mules, sheep and goats. Of birds, eagles,

vultures, the peacock, parrakeets, the adjutant-bird, etc., are characteristic species. Fish are plentiful and in great variety.

Minerals.—India is richly endowed with minerals; hardly a single metal seems to be wanting; but they are not worked to any extent. Coal, iron, and salt receive most attention.

Divisions, Administration, and Population.—In 1858 the administration of the British possessions in India, long held by the East India Company, was transferred to the crown, and in 1877 the British queen assumed the title of Empress of India. The country has long been divided into the three presidencies of Bengal, Madras, and Bombay; but the first of these was latterly subdivided into several provinces, and its name has now little or no administrative significance. The lieutenant-governors, chief-commissioners, and other officers at the head of the various divisions are subordinate to the governor-general or viceroy, representing and appointed by the crown, but each has a large measure of independence. The governor-general in council has power to make laws for all persons within the Indian territories under British rule, and for all subjects of the crown within the allied native states. He acts under the orders of the Secretary of State for India, who is assisted by a council of fifteen and is always a member of the British cabinet. In India the supreme executive and legislative authority is vested in the governor-general, the capital being Calcutta. The British section of the country is divided into the presidencies of Bengal (including a considerable number of provinces), Madras and Bombay. Besides the provinces of India under direct British administration there are a number of native or feudatory states, the relations of which to the British administration are somewhat varied. Practically, however, they are all more or less under control of the Indian government. The total area of British India is estimated at 1,097,901 square miles, that of the native states 679,267. Gujerat, Rajputana, Haidarabad, Mysore, Orissa, and Travancore are important native States. The total population of India, 1901, was 294,361,056, of which the native states had 62,988,224.

Revenue, Money, Weights, etc.—The total revenue to the budget-estimate of year 1910 was £74,375,000 (calculating the rupee at 1*s.* 4*d.*, for its actual value has not exceeded 1*s.* 5*d.* for some years), and the expenditure about the same. The public debt is estimated at £267,200,000. The chief source of revenue is the land-tax, which yields from £20,000,000 to £28,000,000 annually. About 70 per cent. of the population are engaged cultivating the soil, while only about 8 per cent. reside in towns of over 50,000 inhabitants. Opium, which forms a government monopoly, and salt, on which considerable duty is levied, are the other two important sources of revenue. The chief currency in India is silver, but the mints were recently closed. A government paper currency was introduced in 1861. Circles of issue with subordinate agencies were established in the chief towns; and notes from 5000 to 10,000 rupees were made a legal tender within the circle. The chief money denomination is the *rupee*, which is divided into 16 *annas*, the anna again being equivalent to 4 *pice*. The primary standard of weight, called the *ser*, is equal to the French kilogramme, or 2.205 lbs. A weight in common use is the *maund*, in Bengal 82 lbs., in Bombay 28 lbs., in Madras 25 lbs. By an act passed in 1889 the imperial yard is made the standard measure of length.

Communications, Trade, etc.—Some of the irrigation canals as well as the rivers supply means of internal navigation, but the construction of railways has been the most important step taken to render the internal communications of India permanently efficient. A considerable portion of the railway system was constructed by companies on whose capital interest at the rate of 5 per cent. was guaranteed by government. Government, however, no longer entrusts the railways to private enterprise, and all lines sanctioned by it are now constructed by the State. The total sanctioned mileage open and under construction in 1910 was about 32,000 miles. There were 70,000 miles of telegraph line. The imports, including bullion and specie, for year ending March, 1910, amounted to about £100,000,000, and the exports to £107,000,000. About half the imports consist of cotton goods; the exports comprise cotton, opium, oil-seeds, rice, wheat, jute, indigo, tea, cotton goods, etc.

Inhabitants, Languages, etc.—India has been peopled by several races which have now become more or less mixed. The Hindus, who are partly of Aryan or Indo-European origin (see *Indo-European Languages*), partly of non-Aryan origin, are by far the most numerous. In the south dwell people of a non-Aryan and Dravidian stock; and the remainder is made up of Arabs, Parsees, Mongolians, etc. The Europeans number over 125,000, and in addition there are about 110,000 Eurasians, *i.e.* the progeny of Hindus and Europeans. Of non-Aryan languages there are about 150 dialects.

The Dravidian languages, the chief dialects of which are the Tamil, Telugu, Kanarese, and Malayalam, are spoken by about 23 millions of people in Southern India. The principal of the modern Aryan vernaculars derived from the ancient Sanskrit and Prakrit are Hindi, Marathi, Punjabi, Bengali, Uryia, Sindhi, and Gujerati. Hindustani, a corrupted form of Hindi filled with Persian and Arabic words, is the language of the Mohammedan conquerors of India, and has been adopted as the official language and means of general intercourse throughout the peninsula. The leading religion is Brahmanism, the professed creed of the majority of the Hindus and the religion most distinctive of India. It reckoned 207,731,727 adherents in 1901. Large numbers in the north and northwest are Mohammedans (62,000,000). Buddhists number about 9,000,000; Parsees or Fire-worshipers 100,000; Sikhs 2,000,000. Among the Hindus the caste system still prevails. (See *Brahmanism.*) European missionaries have long been active, but only a mere fraction of the people are as yet Christians, about 3,000,000. Education is now making good progress, schools and colleges of all kinds having been established throughout the country. The pupils, however, number only a few millions. There are universities (examining bodies only) at Calcutta, Bombay, and Madras, besides other two at Lahore and Allahabad.

History.—The early history of India is obscurely written in the myths of Sanskrit literature, but the first fact of any certainty is that about the year 2000 B.C., or even earlier, an Aryan people of comparatively high civilization descended from the mountain regions of the northwest into the plains of India, where they subdued the original inhabitants. The expedition of Alexander the Great to the Indus in B.C. 326 gives us a momentary glimpse of that part of India; but up to the time of the Mohammedan conquest there is little authentic political history of India. In the third century B.C. Buddhism was established throughout India, but it afterwards entirely gave way to Brahmanism. The first six centuries of the Christian era were occupied by struggles between the native dynasties and invaders from the northwest. In the eighth century the tide of Mohammedan conquest began with Kasim's advance into Sind (711 A.D.). But the Mohammedans were again driven out in 828, and for more than 150 years afterwards the strong feudal and tribal organisations of the northern Hindu kingdoms were a barrier to the Mussulman advance. At length in the year 1001 Mahmud of Ghasni reduced the Punjab to a province of Ghasni, and the Mohammedan power was gradually extended into Southern India. In 1398 Timur or Tamerlane led a great Mogul (or Mongol) invasion of India, and after sacking Delhi retired into Central Asia. In 1526 Sultan Baber, a descendant of Tamerlane, founded the Mogul Empire in India. His grandson Akbar reigned from 1556 to 1607, and extended his power over most of the peninsula, being distinguished by his justice and his tolerance in matters of religion. His son Jehanghir received an ambassador from James I. of England, in 1615. During the reign of his successor, Shah Jehan, famous for his architectural magnificence, the Mahrattas began to be formidable in Southern India. Shah Jehan was deposed in 1658 by his youngest son Aurengzebe, who made war successfully with the Afghans, the Rajputana tribes, and the rising power of the Mahrattas. The Sikhs, a Hindu sect, formed a religious and military commonwealth in the Punjab in 1675. On the death of Aurengzebe, in 1707, the Mogul empire began to decline, Mohammedan viceroys like the Nizam and the ruler of Oudh asserting their independence, while the great Hindu states of the Sikhs, the Rajputs, and the Mahrattas began to harass the decaying empire. In 1738 Nadir Shah of Persia swept down on Hindustan, sacked Delhi, and carried away sixty millions sterling of treasure. The two immediate successors of Aurengzebe, Bahadur Shah and Jahandar Shah, were incapable rulers, practically under the control of the vizier Zulfikar Khan. The three following were mere names under cover of which Husain Ali, governor of Behar, and Abdulla, governor of Allahabad, controlled affairs. During the reign of Mohammed Shah the Mahrattas, who had already subdued the Deccan, wrung first Malwa (1743) then Orissa (1751) from the feeble grasp of the Mogul emperor. The same year saw the first inroad of the Afghan prince Ahmed Shah, followed in quick succession by other three invasions, to repel which the assistance of the Mahrattas was obtained. In 1761 the decisive battle of Panipat was fought between the Afghans and the Mahrattas, and ended in the defeat of the latter. The victor, Ahmed Shah, still recognized the Emperor Shah Alam, but the dignity was little more than nominal. Shah Alam was succeeded in 1806 by Akbar II. who was succeeded in turn by Mohammed Bahadur Shah, the last Mogul emperor, who died at Rangoon a British state prisoner in 1862.

In the beginning of the sixteenth cen-

tury the Portuguese, following the wake of Vasco da Gama, had established factories and fortresses on the coasts of Malabar, and soon extended their power over nearly all the ports and islands on the coasts of Persia and India. In 1595 the Dutch gained a footing in India. The English East India Company began its commercial settlements in India in 1613, Surat being the chief station. (See *East India Company.*) A grant of a small territory around Madras was received from the Rajah of Bijnagar in 1639, on which was erected the fort of St. George. Madras became a presidency in 1654. Calcutta, ultimately the seat of government in India, was settled in 1690, and became a presidency in 1707. The English early came into collision with the Portuguese and Dutch, but it was the struggle with the French in India, whose first settlements were founded in 1604, for influence over the native princes, that led step by step to the establishment of the British empire in India. The first conflict with the French took place in 1746, when the English lost Madras, which was, however, restored by the treaty of Aix-la-Chapelle. In 1751 Dupleix, the French governor at Pondicherry, was powerful enough to place creatures of his own on the thrones of the Deccan and the Carnatic. The English supported rival candidates, and the result was a second war, which left English influence predominant in the Carnatic, though the French still controlled the Deccan. The most memorable incident in this war was Clive's capture of Arcot. About this time important events took place in Bengal, then a subordinate presidency to that of Madras. The Nawab of Bengal, Sirâj-ud-Daulâ (Surajah Dowlah), attacked the English settlement at Calcutta with a large army, forced it to capitulate, and thrust the prisoners, to the number of 146, into the Black Hole or common prison of the garrison, a room 18 feet square, with two small windows. After a night of unparalleled suffering only twenty-three were found alive in the morning. Clive was at once sent with an armament from Madras, recovered Calcutta, attacked and took the French settlement at Chandernagore, routed the Nawab's army at the battle of Plassey (June 23, 1757), and placed Mir Jaffier on the vice-regal throne, with consent of the Mogul court. In the south the English were equally victorious. A force despatched by Clive took Masulipatam, and the victory gained by Coote at Wandewash on January 22, 1760, completed the destruction of the French power in India.

In Bengal Mir Jaffier soon found himself unable to meet the exorbitant claims of his allies, and in 1760 he was deposed in favor of his son-in-law, Mir Kasim, who agreed to pay the balance due by Mir Jaffier as well as grant the districts of Burdwan, Midnapore, and Chittagong to the English. But disputes soon led to a war, in which Mir Kasim was worsted and forced to flee. The British retained the collectorship or fiscal administration of Bengal, Behar, and Orissa, under the fiction of a grant from the Mogul emperor. A nominal native ruler, however, was still appointed in the shape of a nawab, who received an allowance of £600,000, and the actual collection of the revenues was still left to the native officials. This system of double government established by Clive was abolished in 1772 by Warren Hastings, who appointed English officers to collect the revenues and preside in the courts, and thus laid the foundations of the present system of British administration in India. In 1774 Hastings was made governor-general of India. Among the notable measures of his vigorous rule were the refusal of the £300,000 of the Bengal tribute to the Mogul emperor, the sale of the provinces of Allahabad and Kora (assigned by Clive to the emperor in 1765) to the nawab of Oudh, and the loan of British troops to the same nawab for the subjection of the Rohilla Afghans. For these and other acts, such as the extortion of heavy fines and forfeitures from the Begum of Oudh and the Rajah of Benares, Hastings was impeached on his return to England. (See *Hastings.*) In 1778 the intrigues of the Bombay government led to the first war with the Mahrattas, in which the British arms were only saved from disgrace by the achievements of the Bengal army which Hastings sent to the aid of the other presidency; and in the war with the Sultan of Mysore the diplomatic skill of Hastings, and the valor of the Bengal troops under Sir Eyre Coote, again won victory for the British. In 1786 Lord Cornwallis succeeded Hastings as governor. His rule is memorable chiefly for the war with Tippoo, Sultan of Mysore, which terminated in the sultan having to surrender one-half of his dominions to the British and their allies. Sir John Shore succeeded as governor-general in 1793. He was followed by the Marquis of Wellesley, who arrived in 1798, and whose policy eventually made the British power paramount from the Himalayas to Cape Comorin. Under him Tippoo of Mysore was completely overthrown (1799) and the second Mahratta war successfully concluded. Sir Arthur Wellesley (afterwards Duke of Welling-

ton) having won the victory of Assaye September 23, 1803), and General Lake that of Laswaree (November 1, 1803). In 1805 Lord Cornwallis went out as governor-general for the second time. He died soon after his arrival, and was succeeded by Sir George Barlow, and he by Lord Minto in 1807. In 1809 some disturbances at Travancore and Cochin led to these regions being placed under British control. During the governorship of the Earl of Moira (Marquis of Hastings, 1814-23) there was a war with the Goorkhas of Nepaul, which after a short struggle ended with the cession to the British of Kumáon; and another with the three great Mahratta princes, the Peshwá of Poona, the Rajah of Nágpur, and Holkar of Indore. The Peshwá's territory was annexed; the other Mahratta princes were compelled to accept alliances placing them under British protection. A new province, the nucleus of what are now the Central provinces, was formed out of territory recovered from the Pindáris. In 1823 Lord Amherst succeeded as governor-general. During his administration the first Burmese war arose, and was concluded in 1826 by the cession to the British of the provinces of Aracan and Tenasserim. Under Lord William Bentinck's rule (1828-35) administrative reform and the moral elevation of the peoples of India were chief subjects of consideration. In 1836 Lord Auckland assumed the governorship. Two years later the Afghan war broke out, and terminated in the disastrous British retreat. (See *Afghanistan*.) During Lord Ellenborough's administration Sind was annexed. Sir Henry (afterwards Lord) Hardinge succeeded in 1844, and the year following the Sikhs, originally a religious sect who had conquered the Punjab, crossed the Sutlej in great force. Four hotly-contested battles, at Mudki, Firozshah, Aliwál and Sobráon, left the British masters of the field. Part of the Sikh territory was annexed, and the infant Dhuleep Singh recognized as rajah of the rest. During the governor-generalship of the Earl of Dalhousie, 1848-56, a new war broke out with the Sikhs, and after their final defeat by General Gough at Gujerat, February 21, 1849, the Punjab was annexed to the British dominions. This was immediately followed by the second Burmese war, ending in the annexation of Pegu, June 20, 1853. The Indian states of Sattara, Jhansi, and Nágpur were, on the failure of the native succession, annexed to the British possessions, 1852-56, and Oudh was also brought directly under British rule. During the same administration the extensive scheme of Indian railways and telegraphs and steamship connection with Europe *vis* the Red Sea was planned and inaugurated, the Ganges Canal opened, and the Punjab Canal begun.

The administration of Viscount Canning (1856-61) was distinguished by a short war with Persia, and especially by the great Sepoy mutiny. Several outbreaks among the native soldiers took place during March, 1857. The first formidable revolt, however, was at Meerut on May 10th, where the Sepoys of the 3d Light Cavalry, assisted by the 11th and 20th Regiments of infantry, rose and massacred the Europeans. They then fled to Delhi, where they were immediately joined by the native garrison. Here another massacre took place, and the dethroned descendant of the Moguls once more assumed the sovereignty. The revolt spread rapidly through the Northwestern Provinces and Oudh, down into Lower Bengal. Only in the Punjab the prompt measures of the governing officials in disarming the Sepoys prevented an outbreak, and the Sikh population continued steadily loyal. Wherever the mutiny broke out it was attended with savage excesses; women were outraged, and Europeans without distinction of age or sex barbarously murdered. At Cawnpore the revolted Sepoys were headed by Nana Sahib, the heir of the last Peshwá of the Mahrattas. After a heroic but fruitless attempt to defend themselves, the Europeans capitulated on the sworn promise of Nana Sahib to allow them to retire to Allahabad. On May 27th the survivors, about 450 in number, were embarking when they were attacked by the Nana's troops, and the men indiscriminately massacred. The women and children, 125 in number, were carried back to Cawnpore and kept till the 15th of July, when they were all cut to pieces on the approach of Havelock's army. Cawnpore was stormed the day following. At Lucknow Sir Henry Lawrence had the foresight to fortify and provision the Residency, where the garrison held out till relieved by Havelock and Outram on September 25th. But Havelock was in turn besieged, and was with difficulty relieved (November 17) by Sir Colin Campbell, afterwards Lord Clyde. Delhi, meanwhile, had fallen, chiefly owing to the skill and valor of Sir John Lawrence. By May, 1858, when Bareilly was taken, Sir Colin Campbell and Sir Hugh Rose had restored order, and the mutiny was at an end.

In 1858 the direct sovereignty of India, and the powers of government hitherto vested in the East Indian Company, were

vested in the British crown. Lord Canning returned to England early in 1862, and was succeeded by the Earl of Elgin, who died in 1863. Sir John (afterwards Lord) Lawrence was governor-general from 1863 to 1868, when he was succeeded by the Earl of Mayo, who did much to develop the material resources of the country by removing the restrictions upon trade between the different provinces, and constructing roads, canals, and railways. He was assassinated by a Mohammedan fanatic in the Andaman Islands, February 8, 1872. Lord Northbrook became viceroy in 1872. During his administration a famine in Lower Bengal, successfully obviated by a vast organisation of state relief (1874), the dethronement of the Gaekwar of Baroda for disloyalty (1875), and the tour of the Prince of Wales through India (1875-76), were the chief events. In 1876 Lord Lytton was appointed viceroy, and on January 1, 1877, Queen Victoria was proclaimed Empress of India at Delhi. In 1877-78 a most disastrous famine occurred, and despite the most strenuous efforts of the government over five million persons are said to have perished. In 1878 the intrigues of Shir Ali, amir of Afghanistan, with Russia, led to a declaration of war on the part of the British. After two campaigns Abdurrahman Khan was established on the Afghan throne by British arms. (See *Afghanistan.*) The viceroys of late date include Lord Ripon, 1880; Lord Dufferin, 1884; Marquis of Lansdowne, 1888; George N. Curzon, 1896; Lord Minto, 1905; Lord Hardinge, 1910. On December 12, 1911, George V visited India and was crowned emperor, a splendid 'Durbar' being held and the capital changed from Calcutta to Delhi. In the European war the native princes loyally supported the British armies.

India Matting, a matting woven from the stems of *Papyrus Pangorei* or *corymbosus*, and chiefly exported from Bengal.

Indiana (in-di-an'a), one of the United States, bounded by Michigan lake and state, Ohio, Kentucky, and Illinois. It is almost one continued plain, with the exception of the hills of the Ohio River and Wabash valleys, which rise from 200 to 600 feet above the sea-level, the highest elevation being 1250 feet. The western side of the state, north of the Wabash, is mostly prairie land interspersed with lakes, woodlands, and swamps. The eastern part was originally thickly covered with forests. The soil varies from a deep black sand to clay loam and is generally fertile, nearly one-eighth of the area being open prairie and well adapted to agriculture. Indian corn, wheat, oats, barley, tobacco, and potatoes are the chief agricultural products. Molasses, cidar, wine, honey, cheese, milk are also plentifully produced. Immense herds of cattle and swine are reared, and slaughtering and meat packing is one of the leading industries. Between the Wabash and the Ohio there is a coalfield of nearly 7000 square miles, with a coal of excellent quality, and an output which in 1912 amounted to about 14,000,000 tons. The other chief mineral products include petroleum, natural gas, limestone, sandstone and cement, both Portland and natural rock. The natural gas product was large, but is now practically exhausted. The natural resources of the county have helped to develop the manufactures, which include flour and grist-mill products, foundry and machine shop products, iron and steel products, liquors, etc. Petroleum also yields a large product. The White Water, White River and Wabash are the principal rivers. Water transportation is fairly good. Lake Michigan furnishes an outlet to the north, the Ohio River to the south. The railroads have a length of more than 7000 miles. The principal towns are Indianapolis (the capital), Evansville, Fort Wayne, Terre Haute, New Albany, Lafayette, South Bend, Muncie, Richmond, Gary and Hammond, etc. Indiana was part of the territory ceded by the French to the British in 1763, and by the British to the United States in 1783. It was erected into a State in 1816. Area of the State, 36,354 square miles. Pop. (1910) 2,700,876.

Indiana, a borough, capital of Indiana Co., Pennsylvania, 40 miles W. N. W. of Altoona. It has an extensive trade, also large glass works, tanneries, flour, saw and planing mills, coal interests, etc. There is here a State Normal School. Pop. 5749.

Indianapolis (in-di-an-ap'ō-lis), a city, capital of Indiana, lies on the White River, near the center of the state, situated on a plain. It is the center of numerous railroads, and being surrounded by rich agricultural and mineral regions is a place of great trade and manufactures. It is an important market for grain, livestock, timber, etc., and carries on pork packing, the production of iron goods, agricultural implements, woolens, flour, etc. The city is well built, one of the chief public edifices being the Federal building. Educational and benevolent institutions are numerous, and the public school system has high standing. The first settler appeared in 1820, and in 1824 the city became the state capital. Pop. (1913) 286,935.

Indian Archipelago. See *Malay Archipelago.*

Indian Architecture, comprehends a great variety of styles, among which we may distinguish, as the most important, the Buddhist style, the Jaina style, the Dravidian or style of Southern India, the Chalukyan style, the Modern Hindu or Indian-Saracenic style. The history of Indian architecture commences in the third century B.C., with the religious buildings and monuments of the Buddhists.

Buddhist Great Tope at Sanchi, Central India.

Among the principal forms of BUDDHIST ARCHITECTURE are the following:—First, the *topes*, *stupas*, or towers built to mark some sacred spot, and the *dagobas*, constructions of a similar nature, containing relics of Buddha or Buddhist saints. These buildings generally consisted of a circular stone basement varying from 10 or 12 to 40 feet in height, and from 40 to 120 feet in diameter, on which rose a rounded domical structure, generally of brick or small stones laid in mud, the whole edifice rising sometimes 50, sometimes 100 feet high. (See *Dagobs*, *Tope*.) Second, the rock-cut *chaitya halls* or churches, and the *viharis* or monasteries. Most of these are found in the Bombay Presidency; some also in Bengal and Behar. In rock-cut buildings architectural skill is confined to the façade and the interior, which are generally cut out with most beautiful and perfect detail. Among the most notable for beauty of design are those at Ajanta, and finest and largest of all, the great Chaitya cave at Karli, near Bombay, the date of which is probably about 80 B.C. Another interesting example is at Ellora (which see). The JAINA STYLE is a development or corruption of the pure Buddhist. It is characterised by the square or polygonal court, the twelve-pillared dome, the slenderness and elegance of the columns, the horizontal arch, the *sikras* or towers surmounting the cells containing the images, and, lastly, by the peculiar grouping of many temples together on hilltops. Prominent examples of Jaina architecture are found at Girnar in Gujerat; and at Mount Abu, of the Aravulli range. The DRAVIDIAN STYLE is that of the peoples of Southern India. Its most flourishing epoch comprises the sixteenth, seventeenth, and even eighteenth centuries of our era. To this late period belong the great temples at Tanjore, Tiruvalur, etc. The distinctive parts of a Dravidian temple are the *vimana* or temple proper, with storied pyramidal roof; the *mantapas* or porches, covering the door which leads to the cell; the *gopuras* or gate-pyramids, in the quadrangular enclosures surrounding the vimanas; the *choultries* or pillared halls, used for various purposes. The general characteristics of a Dravidian temple of the first class are the storied pyramidal towers, the hall of 1000 columns, the bold cornice with double flexure, the detached shafts, the richly carved stylobate, and the large tanks with flights of stone steps. The CHALUKYAN STYLE, so named from a dynasty which rose in the sixth century, in what is now Mysore and the

Vimala Sah Jain Temple, Mount Abu—Jaina style.

Nizam's Territory, reached its perfection in Mysore from eleventh to fourteenth centuries. The characteristic features are the open porch, the straight-lined, conical-

The Great Pagoda, Tanjore—Dravidian style.

shaped tower, the star-shaped temple, and the basement terrace of stone. The INDIAN-SARACENIC STYLE is a general name for a number of somewhat varying styles, the result of the mixture of Saracenic principles of architecture, brought with them by the Mohammedan conquerors of India, and the distinctive architectural features of the different localities where they settled. Under the Mogul emperors in the sixteenth century were erected some most magnificent buildings, such as the tomb of Humayun Shah at Old Delhi; that of Akbar at Secundra (see *Akbar*); the palaces of Shah Jehan at Agra and Delhi; and the famous and most beautiful Taj Mahal, built by the same monarch at Agra. The Moslem architecture of India contrasts with the native Indian styles in its use of the radiating arch, in the superior simplicity and grandeur of its style—its flat ornamentation not interfering with the lines of true architectural construction. A characteristic feature also is its fine conventionalism of vegetable forms for decoration and tracery. See *Saracenic Architecture*.

Indian-bay, *Laurus indica*. See *Laurel*.

Indian-berry, *Cocculus indicus*. See *Cocculus*.

Indian-cedar. See *Deodar*.

Indian Corn. See *Maize*.

Indian Fig, a name given to the *Opuntia Tuna* and *O. ficus-indica*, and other species of the Cactus family common in the tropical and sub-tropical countries of America, and now naturalised in Africa, Asia, and Southern Europe. They are generally from 10 to 12 feet high. Their fruit, which is egg-shaped and from 2 to 3 inches long, is cooling and wholesome, and yields a juice used for coloring confectionery. The wood of the stems becomes very hard with age.

Indian Hemp, same as *Cannabis Hemp* (which see).

Indian Ink, a practically indelible writing ink of which there are two principal kinds—one prepared in Italy, Turkey, and Asia from certain cuttle-fishes, the other in China by fixing fine lamp-black with glue or size and a little camphor. The former when submitted to the action of an alkali becomes brown sepia.

Indian Mutiny. See *India* (*History*).

Indian Oak, a popular name for the teak-tree (which see).

Indian Ocean, that great body of water which has Asia on the north, the Sunda Isles and Aus-

Exterior of the Chaitya Cave, Ajanta—Buddhist style.

tralia on the east, Africa on the west, and the Antarctic Ocean on the south. The Cape of Good Hope and the southern extremity of Tasmania may be considered its extreme southern limits on the

west and east. Its length from north to south somewhat exceeds 6500 miles, its breadth varies from 6000 to 4000 miles. It is traversed by the equatorial current flowing east to west, and its navigation by sailing vessels is more or less modified by the trade-winds and monsoons; greatest known depth, 3950 fathoms.

Indians (in'di-ans), AMERICAN, the collective name given to the tribes inhabiting the continent at the time of the discovery by Columbus, and to such of their descendants as still survive. The name of Indians was first given to these races from the notion that the newly discovered continent formed part of India. The inhabitants of India came later to be distinguished as East Indians and the others as American Indians, for which the contracted form, *Amerinds* was proposed and adopted by some writers. Other popular names for the American Indian are *Red men* or *Redskins*. Various theories as to their Asiatic origin are current, but so far as is known their culture is indigenous, being the reactions of the Indian to his environment. The Eskimo, the most northerly of the tribes, extends across the continent along the Polar Sea. South of these are the Athabascan group, represented by the Ten'a, Kaiyuhkho' 'tenne, and Tutchonekut'qin tribes on the Yukon River. The other Athabascans are chiefly found between Hudson's Bay and the Rocky Mountains, but include also the Dogribs, Caribou eaters, Nahanés Yellowknives and Slavé Indians of northwestern Canada and the Beaver Indians on Lake Athabasca; the large Navajo tribe of Arizona and New Mexico, and the Apaches, of Arizona, New Mexico and Oklahoma. Canada and the United States east of the Mississippi were formerly inhabited by the Algonquin and the Iroquois, generally at war with each other. The extreme west of the Algonquin region was occupied by the Blackfeet Indians; the Ojibwas, or Chippewas, held the shores of Lake Superior; south and west of Hudson's Bay were the Crees. The Leni-Lenape section of the Algonquin group comprised the five nations of the Delawares, including the Mohicans. The Iroquois included the Senecas, Cayugas, Onondagas, Oneidas, and Mohawks, who formed a league of five nations, afterwards joined by the Tuscaroras. The Hurons were of the Iroquois group. The Sioux group occupied the plains between the Rocky Mountains and the Mississippi, and included the Assiniboins, Winnepegs, Iowas, Dakotas, Omahas, Osages, Kansas, Crows, and Mandans. West of the Mississippi also were the Pawnees about the Nebraska or Platte River, and to the southeast were the Choctaws and Chickasaws. In the Rocky Mountain regions were the Shoshone or Snake Indians, including the Comanches and others. The Cherokee tribes, which inhabited South and North Carolina, the Creeks and Seminoles of Georgia and Florida, formed a detached group, and the Texas Indians were comprised in many small and diverse tribes. Below these, in New Mexico, a more advanced and distinct family is found called Moquis or Pueblo Indians, and westward the Apaches and various other tribes. Of the numerous families occupying Mexico the Nahuatls or Aztecs were the most powerful and civilised. The Otomis, speaking a peculiar language, were also a numerous people in Mexico. In Central America the predominating family was the Maya, including the Quichés, Kachiquels, etc. Portions of the Aztec tribes were also found in Central America. In South America the leading and more advanced families were those that made up the Peruvian Empire, among which the Inca race and the Aymaras were the chief. The Araucanians, to the south of these, in Chile, had a considerable resemblance to the Algonquins and Iroquois of North America. The remaining portions of South America, including the great alluvial tracts of the Atlantic slope, were principally occupied by the Guaranis; but along its northern coast were found the Caribs, who spread also over the Antilles and most of the West Indian Islands. In the extreme southern part of the continent live the tall Patagonians or Tehuelches, and squalid families in some respects resembling the more debased Australians.

By some ethnologists the American Indians are considered an aboriginal and single stock; by others a mixture of Mongolian, Polynesian, and Caucasian types; and by others as derived from the grafting of Old World races on a true American race. They are generally characterized as having long, black, and straight hair, scanty beard, heavy brows, receding forehead, dull and sleepy eyes, a salient and dilated nose, full and compressed lips, and the face broad across the cheeks, which are prominent, but less angular than in the Mongolian. The facial angle is about 75° (about 5° less than the European average); the hands and feet are small and well proportioned. The complexion varies from dark-brown to almost white; a somewhat reddish tint is common. The North American Indian is described as of haughty demeanor, taciturn and stoical; cunning, brave, and often ferocious in war; his temperament

poetic and imaginative, and his simple eloquence of great dignity and beauty. The Mexico-Peruvians worshiped the sun with human sacrifices and the grossest rites. Those of the United States and Canada believe in the two antagonistic principles of good and evil, and have a general belief in manitous, or spiritual beings, one of them being spoken of as the *Gitche Manitou*, or Great Spirit. They believe in the transmigration of the soul into other men and into animals, and in demons, witchcraft, and magic. They believe in life after death, where the spirit is surrounded with the pleasures of the 'happy hunting grounds,' though they have no idea that the acts of their present life can have any connection with their future happiness. The totem is a badge or symbol of the name of a gens or tribe of the family; this is generally some animal (the turtle, bear and deer being favorites), which is the mark of distinction even when expanded into tribes. No marriage rite is necessary beyond the consent of the parties and their parents; but the wife may be dismissed for trifling causes, and polygamy is allowed. In ancient times the body was covered with furs and skins according to the seasons, but now the white man's clothes and blanket have generally superseded the native dress; though the moccasin of deer or moose hide, and in the wilder tribes the ornamental leggings and headdresses are largely retained. Their dwellings are made of bark, skins, and mattings of their own making, stretched on poles fixed in the ground. Their arms consist of the bow and arrow, the spear, tomahawk, and club, to which have been added the gun and knife of the whites. Canoes are made of logs hollowed out, or of birch bark stretched over a light frame, skilfully fastened with deers' sinews, and rendered water-tight by pitch. The Indians of the United States, however, are now largely gathered into reservations and their former dress, arms and habits are being changed for those of the whites. Civilization is invading them and driving out their older characteristics. This is especially the case with the large numbers now dwelling in the former Indian territory, now Oklahoma. The antiquities found in Mexico and Peru, and the ruins of elaborate buildings in Central America, prove that the semi-civilized races there existing had made considerable progress in sculpture and architecture. The number of Indians in the British possessions is about 130,000, in the United States (1910), 265,683, in Central America 1,500,000, and in Mexico 4,000,000, in all North America somewhere about 6,000,000. In South America their number is probably about 10,000,000, many of them being more or less civilized and professing Christianity.

Indian Shot (*Canna indica*), an ornamental plant of the Arrow-root family, found in most tropical countries. The seeds are round, hard, and black, hence the name of Indian shot applied to the plant.

Indian Summer, the name given to a period of mild summer weather which generally occurs towards the end of autumn in North America, usually in November.

Indian Territory, See *Oklahoma*.

Indian Yellow, or Purree, a pigment of a bright yellow color, but not permanent; used in water-color painting. It is composed of the phosphate of urea and lime, and is imported from India.

India Paper, a name originally given to a very light, absorbent buff paper made by hand in China. The use of the word 'India' was probably due to the tendency to give that name to anything originating in the East. Its first use was in printing very fine engravings, which were therefore commonly called 'India proofs.' The original India paper was introduced into Europe in 1841, where tests showing its great strength and durability created wide interest among paper manufacturers, who thereupon undertook to duplicate it. The term is now used to describe an extremely light, thin paper, very tough and opaque, made principally in England, Germany, Italy, France, Holland and Belgium, and used especially in printing Bibles, but also frequently in other books where it is desirable to reduce their bulk and weight, without affecting their durability, or necessitating smaller type.

India paper is essentially a rag paper, no mechanical wood pulp being used. The opaque character is due to the large percentage of mineral matter remaining in the fiber. Even more important than the materials used is the great skill and care exercised throughout the processes of manufacture to retain the mineral matter.

India Rubber, a peculiar elastic substance composed of carbon and hydrogen, found in suspension in the milky juice of many different families of plants. (See *Caoutchouc*.) The crude rubber is usually prepared where the juice is collected, by drying the juice over a fire in the sun on moulds of clay, paddles, or lasts; by evaporating the juice in the sun and removing the

successive pellicles formed on the surface; or by coagulating the juice, as in Nicaragua, by an application of the juice of the bejuca vine, and kneading and rolling the coagulated mass. Most of the rubber of commerce is derived from Brazil and the Andes states of South America, also from Central America, Mexico, etc.; smaller quantities from Java, Penang, Singapore, Assam, and South Africa. The purest comes from Pará, Brazil, in large bottles and thick plates. Prior to the introduction of rubber into Europe, in the early part of the eighteenth century, it had already been turned to various domestic and industrial uses, such as the making of bottles, syringes, boots, and waterproofing, by the natives and residents along the banks of the Amazon. In Europe the first important practical applications of it are associated with the names of Mackintosh, the patentee in 1823 of a waterproofing process by the solution of the gum in oil of turpentine and alcohol and in coal-tar naphtha, and Handcock, the inventor of the 'masticator,' a machine for the condensation of crude lumps or shreds of caoutchouc, as imported, into compact homogeneous blocks for subsequent division into cakes, sheets, rollers, etc. Its great modern utility, however, is due to the American inventor, Charles Goodyear, the inventor of the vulcanising process, in which rubber is hardened by the addition of sulphur, patented in 1844. Since then its uses have multiplied so rapidly that it is employed in every department of industry. Thus apart from its use in blocks and sheets, etc., in tapes or threads for weaving into elastic tissues, and as varnish for waterproofing, it is employed, in combination with other resinous materials in a solvent such as naphtha, as a cement or marine glue. When combined with a small quantity of sulphur, etc., it is used for the manufacture of overshoes, boots, gloves, life-preservers, gas-bags, steam and water packing, belting, fire-hose, tubing, springs, tires, artificial sponges, etc. With a larger proportion of sulphur, and cured or vulcanized by exposure to a high temperature, it is used for the manufacture of combs, pen and pencil holders, rulers, inkstands, buttons, canes, syringes, jewelry, and, when colored with vermilion, for mountings for artificial teeth, etc. In combination with asphalts, oils, and sulphur, etc., and vulcanized (*berito*) it is used for covering telegraph wires. A new field for its use has lately developed in the large automobile tires, the rapid progress of the automobile industry having so greatly increased the demand as to bear heavily on the sources of supply and considerably increase the market value of rubber. The insufficient supply has led to active search for new sources and the development of existing sources, especially that of Mexico, which has become one of the important rubber producers. Lazaculapa district, Chiapas, is the largest in the world, with 7,000,000 trees and an output of 100,000 lbs. The export from Brazil in 1910 was 38,953 tons, of which 17,071 came to the United States. The Palo Amarillo tree and the Guayule shrub of Mexico yield rubber in addition to the regular rubber tree, and rubber-yielding plants have been found elsewhere, as in Mozambique and Africa south of the Zambesi, where is a thick vine called the laudolphia, which yields this product.

Indicative (in-dik'a-tiv), that mood of the verb in which something is said positively; hence it has also been called the positive mood, as distinguished from the subjunctive and potential.

Indicator (in-di-ka'tur), (1) an instrument for ascertaining and recording the pressure of steam in the cylinder of a steam-engine, in contradistinction to the steam-gauge, which shows the pressure of the steam in the boiler. (2) An apparatus or appliance in a telegraph for giving signals or on which messages are recorded, as the dial and index hand of the alphabetic telegraph. (3) A genus of African birds, the honey-guides or honey-guide cuckoos. See *Honey-guide*.

Indic Languages, the class of Indo-European (Aryan) languages comprising the dialects at present spoken in India, as Hindi, Hindustani, Mahratti, Bengali, and the dead languages Prakrit, Pali, and Sanskrit.

Indiction (in-dik'shun), in chronology, a period or cycle of fifteen years, supposed to relate to some judicial acts, probably the publication of tariffs of the taxes which took place at stated intervals under the Greek emperors. Three sorts of indiction are mentioned:—(1) the Cæsarean, which fall on the 8th of the calends of October, or 24th of September: (2) the indiction of Constantinople (beginning A.D. 312), on the 1st of September; and (3) the pontifical or Roman, which begins on the calends of January. We find ancient charters in England dated by indictions.

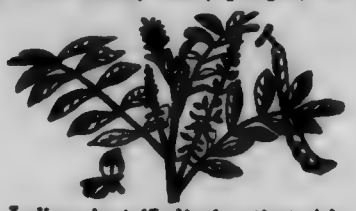
Indictment (indit'ment), in law, a written accusation of one or more persons for a crime or misdemeanor, preferred to and presented

upon oath by a grand jury to a court. Indictments must have a precise and sufficient certainty.

Indigestion (in-di-jest'yun). See *Dyspepsia*.

Indigirka (en-dye-ger'kä), a river of Eastern Siberia, flowing northwards into the Arctic Ocean; length 750 miles.

Indigo (in'di-gō), a blue vegetable dye, extensively employed in dyeing and calico-printing; an important commercial product in the East and West Indies, Mexico, Brazil, Egypt, etc. It is chiefly obtained from various leguminous plants of the genus *Indigofera*, herbaceous or shrubby plants, with pinnate leaves, and small, blue, purple, or white



Indigo-plant (*Indigofera tinctoria*).

pea-shaped flowers disposed in axillary racemes. They are very numerous in the equatorial regions of the globe. The species most commonly cultivated are the *I. Anil*, a native of Tropical America, but now cultivated also in the East Indies; the *I. tinctoria*, also cultivated in both Indies; and the *I. cærulea*. The *I. tinctoria* is the species most abundantly cultivated. The greater part of the indigo used at the present day comes from India, especially from the provinces of Bengal, Oude, and Madras. The ground is ploughed towards the end of the year, and the seed sowed in the early spring of the following year. The first cutting of the plants takes place about midsummer, and the second about two months later, the process of extracting the dye varying as the leaves are fresh or dried. Indigo occurs in the market in pieces which are sometimes cubical, sometimes of an irregular form; these pieces are easily broken, the fracture being dull and earthy. The color varies from light-blue to blackish-blue; when rubbed with the nail a copper-colored streak is formed on the surface of the mass. Indigo is insoluble in water, but when exposed to the action of certain deoxidizing agents it becomes soluble in alkaline solutions, losing its blue color and forming a green solution from which, when precipitated by acids, it becomes white, but it instantly becomes blue on exposure to the air. Commercial indigo contains about 50 to 60 per cent. of pure indigo blue, the remainder consisting of substances called indigo gluten, indigo yellow, indigo red, etc. Artificial indigo is now produced by chemical processes, having been discovered in 1878. This has come into use sufficiently to diminish the demand for the natural product, and is said to be superior to the latter in color and wearing powers.

Indigo-bird, a North American bird (*Cyanospiza cyanea*) of the finch family. It is of a deep-blue color, and is a good songster.

Indigo-copper, the native protosulphide of copper, of an indigo-blue color.

Indigofera (in-di-gof'e-ra), a large genus of plants, nat. order Leguminosæ, including about 220 species, indigenous in the warmer parts of Asia, Africa and America. See *Indigo*.

Indigometer (in-di-gom'e-tèr), an instrument for ascertaining the depth of color of indigo.

Indium (in'di-um), a metal discovered by Reich and Richter in 1863 by means of spectroscopic analysis in the zinc-blende of Freiburg. It has been isolated in small quantities, and is of a silver-white color, soft, and marks paper like lead; specific gravity, 7.421 at 16°.8. The metal is related to cadmium and zinc, and its spectrum exhibits two characteristic lines, one violet and another blue.

Indo-China, the name now given to the southeastern peninsula of Asia, comprising Burmah, Siam, Cambodia, Cochin-China, Tonquin, Anam, etc. It was formerly known as Farther India.

Indo-European Languages, also called ARYAN or INDO-GERMANIC, the most important of the great families into which human speech has been divided, spoken by various peoples in Asia and Europe. The chief branches of this family are the Teutonic or Germanic, including English, German, Dutch, Danish, Swedish, Icelandic, and the extinct Gothic; the Slavonic (Polish, Russian, Bohemian); the Lithuanian; the Celtic (Welsh, Irish, Gaelic, Breton); the Latin or Italic, and the Romance tongues descended from it (French, Italian, Spanish, Portuguese); the Greek, the Armenian, the Persian, and the Sanskrit. All these tongues are regarded as being descended from a common ancestral tongue or parent speech spoken at some remote period in the original home of the Aryans. This home has been variously located in Central Asia, Scandi-

navia, Caucasia, etc., by different writers. See *Philology*.

Indore, or INDOR (in-dōr'), a protected native state of Hindustan, connected with Central India, and consisting of several detached portions, the largest being bisected by the Narbada; total area, 8400 sq. miles. It forms the remnant of the sovereignty of the Mahratta dynasty of Holkar, and Holkar as the family name is associated with the title Maharajah, which belongs to the ruler of the state. It is traversed by the Vindhya Mountains, and much of the country is well wooded. Indore is generally fertile, the cultivated crops including wheat, rice, millet, cotton, sugar-cane, oil-seeds, tobacco, and opium, which is one of the principal products. Among the inhabitants are numerous Bheels. The ruling class are Mahrattas. The Holkar dynasty was founded by Mulhar Rao about the middle of the eighteenth century. Their dominions were at one period much more extended than at present. Pop. about 850,000.—INDORE, the capital, is of modern origin, and in recent times has rapidly increased. The Maharajah's palace is the most conspicuous edifice. The British residency is one of the handsomest in Hindustan. Pop. (1911) 44,947.

Indorsement (in-dors'ment), or ENDORSEMENT. See *Bill*.

Indra (in'dra), a Hindu deity, originally representing the sky or heavens, and worshiped in the Vedic period as the supreme god, though he

Indra.—Coleman's Hindu Mythology.

afterwards assumed a subordinate place in the Pantheon. He is commonly represented with four arms and hands riding on an elephant. When painted he is covered with eyes. He is at once beneficent as giving rain and shade, and awful and powerful in storm as wielding the thunderbolt. In one aspect he is lord of *Swarga*, the beautiful paradise where the inferior gods and pious men dwell in full and uninterrupted [illegible] felicity.

Indre (ańdr), a department of Central France; area, 2660 square miles. It belongs to the basin of the Loire, which receives its waters by the Indre, a river of 140 miles length, the Creuse, and the Cher. The department is generally flat, and nearly two-thirds of the surface is arable. Large crops of wheat and barley are produced; other important crops are hemp and flax. A considerable quantity of land is occupied by vineyards. The minerals include iron, lithographic stones, and several varieties of marble. The principal manufactures are fine woolen cloth, and iron and steel goods, linen, hosiery, etc.. Chateauroux is the capital. Pop. 290,216.

Indre-et-Loire (ańdr-ā-lwär), a department of Central France; area, 2377 square miles. It belongs to the basin of the Loire, and is traversed both by it and its tributary the Indre, as also by the still more important tributaries the Vienne and the Creuse, besides the Cher. They are all navigable within the department, and furnish it with almost unlimited means of water communication. The surface is finely diversified, and more than one-half is arable. Hemp and flax are extensively cultivated, and fruit is very abundant. Iron is worked to some extent; and there are valuable millstone quarries. Clay, both for ordinary purposes and the finer kinds of pottery, is abundant. The manufactures are not of much importance. Tours is the capital. Pop. 337,916.

Induced Current (in-dūst'), the current of electricity which is produced or excited in a conductor when the magnetic field in which it is placed is altered in any way; that is, 1st, when the strength of the current in a neighboring conductor is altered; or 2d, when a neighboring conductor in which a current flows is altered in position; or 3d, when a neighboring magnet is moved; or 4th, when the magnetization of a neighboring magnet is altered. Thus, if there is a closed circuit, say a coil of wire with its ends joined, through which no current is passing, the motion of a magnet in its neighborhood will induce a current in it, the direction of this current being always such as to oppose the motion.

Induction (in-duk'shun), in logic, is that process of reasoning by which we rise from the particular to the general, and is the counter-process to deduction. In induction particulars

are not only raised into generals, but these into still higher generalities. In following this method we proceed from the known to the unknown, and obtain a conclusion much wider than the premises. Thus a person who has had any experience easily arrives by induction at the conclusion that fire burns wood, and when any piece of wood whatever is presented to him he will have no hesitation in saying that fire will burn it. As it is impossible that all particulars can be observed, there is always a certain risk of error, and the inductive method must be worked with extreme caution; but science properly so called would be impossible if we did not presuppose a faculty of arriving from experience at the knowledge of truths not contained in that experience. Hence the ground of induction is the established fact that nature is uniform.

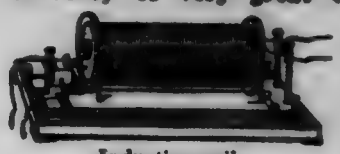
Induction, in English ecclesiatical law, the investing of a clerk presented to a benefice with the temporalities thereof. The person inducting takes the clerk by the hand, and lays it on the ring, key, or latch of the church-door or wall of the church; or he delivers a clod, turf, or twig of the glebe, and thus gives corporal possession of the church. The doors are then opened, the clerk put into the church, and the bell tolled to make the induction known. The incumbent must assent to the Thirty-nine Articles and the Book of Common Prayer, and take the oath of allegiance. In Scotland the minister is inducted by the presbytery.

Induction, ELECTROMAGNETIC, the action by which a current of electricity is produced in a conductor when the magnetic field in which it is placed is altered in any way. See *Induced Current*.

Induction, ELECTROSTATIC, the action by which the distribution of a charge of electricity on a conductor is altered by the approach of an electrified body. When a body charged with one kind of electricity is approached towards an insulated conductor which originally had no charge, a charge similar to that of the influencing body is produced on the remote side, and an equal charge of the opposite kind on the near side of the insulated conductor. It is to the mutual induction between the two coatings, one charged positively, that the Leyden-jar is indebted for its large electrical capacity.

Induction, MAGNETIC, the action by which iron and other substances become magnetic when in a magnetic field, that is, when in the neighborhood of magnets or currents of electricity. See *Electro-magnetism, Magnetism*.

Induction-coil, an instrument invented by Ruhmkorff, in which rapid breaking and making of the current of electricity in a primary short coil of wire gives rise to a succession of induced currents (see *Induced Current*) of very great electro-



Induction-coil.

motive force in a long secondary coil. Such a coil often consists of a copper wire many miles in length, and a succession of powerful sparks passes between its terminals when the primary current is rapidly made and broken.

Indulgence (in-dul'jens), in the Roman Catholic system is the remission granted by the church to a repentant sinner of the temporal punishment due to his sin, whether this punishment be the pains of purgatory, or penance which the church has the right to impose according to the gravity of the sin. It must be understood that the indulgence is never to be considered as constituting a remission of the sin itself. The principle of indulgences rests on that of good works. Many saints and pious men have done more good works and suffered more than was required for the remission of their sins; these are known as *works of supererogation*, and the sum of this surplus constitutes a treasure for the church, which is under the control of the pope, who is privileged to make use of it as he finds advisable in exchange for pious works. Indulgences are of two kinds: *plenary*, when considered an equivalent substitute for all penance; and *partial*, when only a portion of penitential works is relaxed. *Local* indulgences are attached to particular places, *real* indulgences to various good works. The historic origin of indulgences is traced to the public penances and the canonical punishments which the early Christian church imposed on offenders, especially on those who were guilty of any grievous crime, such as apostasy, murder, and adultery. When ecclesiastical discipline became milder it was allowed to commute these punishments into fines for the benefit of the church. The first recorded instance of the use of the name indulgence was by Alexander II in the

eleventh century, but the institution itself was in full development during the Crusades. At first the only source of indulgences was in Rome, and they could be obtained only by going there. The suppositious abuse of granting indulgences inflamed the zeal of Luther, and the Protestant theologians have always found indulgences one of the most assailable points of the Roman Catholic system.

Indus (in'dus), the chief river of the northwest of Hindustan. It has a length of about 1800 miles, drains an area of about 370,000 square miles, and rises in Tibet on the north of the Himalaya Mountains. At first it flows in a northwesterly direction, but after bursting through the Himalayas flows southwest till it enters the Indian Ocean. At Attock it is joined by the Kabul from Afghanistan, and here, 950 feet above the sea, it is nearly 800 feet wide, and from 30 to 60 feet deep according to the season. Near Mittankot it receives on the east the Panjnad, or united stream of the 'Five Rivers' of the Punjab. In Sind it gives off several extensive arms or canals, which are of great value for irrigation; and below Haidarabad it divides into a number of mouths. Its delta extends about 130 miles along the coast. Vessels drawing more than 7 feet cannot generally enter any of its mouths; but steamers of light draught ascend from Haidarabad to Multan.

Industrial and Provident Societies, societies that carry on some trade for the mutual benefit of the members. In Great Britain various acts have been passed for the regulation of such societies, the most important being in 1876, amending and consolidating all previous acts. The Societies which may be registered under this act are societies for carrying on any labor, trade, or handicraft, whether wholesale or retail, of which societies no member other than a society registered under this act shall have or claim an interest in the funds over £200. No society can be registered which has a membership of less than seven persons; and every society must have a registered office; must publish its name outside the office and elsewhere; must submit its accounts to an annual public audit; must send annual returns to the registrar, etc. A register of its members' names must be properly kept. The registrar, on application of one-fifth of the members, may, with the consent of the treasurer, appoint one or more inspectors to examine into the affairs of the society and report thereon. Societies of this kind have made no progress in the U. S.

Industrial Education in a broad sense includes all vocational education relating to the industries. In common usage, however, the term is not applied to the professional training of the engineering schools (see *Technical Schools*), or to manual training of the elementary schools (see *Manual Training*), but to the field of specialized training lying between the two. Both trade and technical education are the development of the nineteenth century, and owe their appearance, on the one hand, to the growth of the factory system with its division of labor and the breakdown of the apprenticeship system, and, on the other, to the increased application of science to the industries. The first important step in the direction of such education in the United States was the establishment of a number of evening schools under private auspices. The first trade school established in the United States was the New York Trade School, founded in 1881. Another movement led to the establishment of preparatory trade schools for youths of legal working age, who now leave the elementary schools in large numbers. These schools do not aim at specialized trade training, but afford instruction that will give a boy or girl a definite advantage in entering upon the work of mill or factory, or in entering upon apprenticeship at a skilled trade. A part-time or co-operative plan, is also employed in some cities.

I. W. W. (Industrial Workers of the World). See *Labor Organisations.*

Inertia (in-ėr'shi-ȧ), or Vis Inertiæ (Lat. the 'power of inactivity'), the passiveness of matter, or its indifference to rest or motion. Newton's first law treats of this property, in virtue of which a body at rest will remain at rest, and a body in motion will continue to move in a straight line and with a uniform velocity unless some force acts upon it.

Infallibility (in-fal-i-bil'i-ti), exemption from the possibility of error in regard to matters of both faith and morals—a claim made by the Roman Catholic Church both on its own behalf and on that of the pope. The infallibility of the church is of two kinds, *active* and *passive;* the former signifying the function of the church of authoritatively settling doctrinal disputes; and the latter that property in virtue of which she can never embrace erroneous doctrine. The infallibility of the pope was settled in the Vatican Council, 1870. The dogma was

then formulated in the following terms: —'We teach and define that it is a dogma divinely revealed; that the Roman pontiff, when he speaks *ex cathedra*—that is when in discharge of the office of pastor and doctor of all Christians, by virtue of his supreme apostolic authority, he defines a doctrine regarding faith or morals to be held by the universal church, by the divine assistance promised to him in blessed Peter—is possessed of that infallibility with which the Divine Redeemer willed that His church should be endowed for defining doctrines regarding faith or morals, and that, therefore, such definitions of the Roman pontiff are irreformable of themselves, and not from the consent of the church.' A considerable body refuse to acknowledge the infallibility of the popes. See *Old Catholics*.

Infant (in'fant), a term in the English and American law for persons who have not attained their *majority*, that is, the age of twenty-one years. In general, contracts made by infants are not binding, except for necessaries suited to their state. Being an infant is no bar to criminal proceedings; but young persons are not punished for offences if they have not knowledge and discretion to distinguish them to be such. Infants require the consent of parents or guardians to marry. The jurisdiction in respect to infants is generally vested in either probate or orphans' courts.

Infante (in-fan'te), or INFANT (from Lat. *infans, child*), the title given in Spain and Portugal to the princes of the royal house. The princesses are called *infanta*.

Infanticide (infan'ti-sid), the murder of an infant, a crime that is especially common in the case of illegitimate children, the main cause being shame; but infanticide is sometimes the result of puerperal insanity. In trial for infanticide it must be proved that the child was born fully alive. Infanticide was prevalent in Greece and Rome. In modern times many barbarous nations are guilty of wholesale child-murder. Among the South Sea Islanders and aboriginal Australians the destruction of infant life is systematized. The Hindus destroy female children without compunction, and abortion is common among the Mohammedans. In China, also, infanticide is common.

Infantile Paralysis, an infectious disease, a form of spinal paralysis occurring frequently in young children. It comes on suddenly, and the paralysis itself may not be observed until several days have elapsed. The early symptoms are fever, convulsions, sometimes vomiting, and numbness or tingling in the limbs affected. The paralysis affects usually one leg, more often two, occasionally the arms and the face. The whole of the limb is not necessarily paralyzed; often only a certain group of muscles is affected. These muscles rapidly waste and become flaccid. In less severe cases not the whole limb but only a group of muscles is affected, and there is always some hope of return of power. Usually, however, a limb paralyzed in infancy does not grow. Few cases are fatal.

The alarming increase of the disease in the United States within recent years has led to wide study and much speculation. Investigations have shown that the disease is transmissible and that it is due to a specific organism. During the acute stages of the disease, therefore, patients should be isolated and all discharges from the nose and mouth should be disinfected. Treatment at the outset should be directed to the relief of the pain, and the promotion of elimination by means of laxatives, nourishing food, hot baths, etc. About a month afterward local treatment of the atrophied muscles should be commenced, and effort made to prevent deformities. For the connection of the stable fly with infantile paralysis see *Stable Fly*.

Infantry (in'fan-tri), foot-soldiers collectively. Except among semibarbarous nations, and during the prevalence of the institutions of chivalry, infantry has always been considered the most important military arm, and this has been peculiarly the case since the formation of standing armies. Infantry may be divided into various classes, most commonly into light infantry and infantry of the line. Under equal circumstances well-trained infantry is almost universally successful against any other kind of troops.

Infant Schools, institutions established in the latter part of the eighteenth century for the education of very young children. Waldbach, in Alsace, and New Lanark, in Scotland, are both claimed as the cradle of the infant school.

Infection (in-fek'shun) a term sometimes used to signify the communication of disease through the atmosphere, as contrasted with *contagion* (*con*, and *tango*, to touch), communication of disease through the medium of touch. In many cases infection and contagion are used as synonymous. Some diseases may spread in both manners,

Infectious Diseases. See *Contagion.*

Infernal Machines (in-fĕr'nal), contrivances made to resemble some harmless object, yet filled with a dangerous explosive. They are arranged to be set off by clock-work, or on opening a box containing the explosive. The bombs of dynamite or other explosive substance now so often thrown or set off by a fuse for the purpose of causing death or destruction of property must be classed in the same category.

Infinite (in'fin-it), a term in metaphysics, which has been the source of much controversy. Some maintain that there corresponds to infinity a distinct notion; while others affirm that the word is a name for a mere negative, that we can never really form any distinct idea of the infinite.

Infinitesimal (in-fin-i-tes'i-mal), in mathematics, an infinitely small quantity, or one which is so small as to be incomparable with any finite quantity whatever, or which is less than any assignable quantity. The *infinitesimal calculus* is a department of the higher mathematics which embraces both the *differential* and the *integral calculus*.

Infinitive (in-fin'i-tiv), the indefinite mood of a verb, or that in which the verb is represented without a subject: the mere name-form of the verb. As the verb expresses an action, or a state, it generally belongs to a subject whose action or state is expressed; but if we wish to express the mere idea of this action or state we use the infinitive, which, therefore, in many languages is employed without further change as a substantive—for instance, in Greek and German—only preceded by the neuter article. The infinitive may be regarded as the point of transition from a verb to a substantive, and is often used as the subject of a proposition.

Infirmary (in-firm'a-ri). See *Hospital.*

Inflammation (in-fla-mā'shun), a vague term for a morbid process, of which the most obvious phenomena are pain, swelling of the affected part, perceptible increase of heat to the patient, and redness beyond the natural degree, often followed by febrile symptoms. Inflammations may arise from external injuries, or may be brought on by morbid or poisonous matters in the system, sudden changes of temperature, etc. The three commonly described terminations of inflammation are *resolution*, *suppuration* and *mortification* or *sloughing*. *Resolution* is that recovery from the disorder which is effected without the intervention of any disorganising process, and when the vessels return to their normal condition on the exciting cause of the disorder being withdrawn, and this is the most favorable mode of termination. If inflammation cannot be resolved it may go on to *suppuration*, when the skin is either divided by the knife or breaks of itself, and there is an escape of a yellow, cream-like fluid, after which the symptoms may abate. The tendency to suppuration is marked by the pain becoming full and throbbing, while the pulse becomes more full without being less frequent. *Mortification* is accompanied by the sudden cessation of pain, and there is the actual death of the part affected. When the circumstances are favorable this dead part sloughs off by a vital process known as *ulceration*, and the cavity gradually fills up and heals. In many cases inflammation may rather be considered as a salutary process than as a disease, for it frequently prevents evils which would occasion either serious or fatal consequences. The most important remedy in cases of severe inflammation is hot fomentations, blisters, bloodletting, the warm bath, combined with low diet and perfect quietude. In the beginning cold is excellent. As to inflammation of the intestines, see *Enteritis;* of the eye, see *Iritis;* of the bowels, see *Peritonitis;* of the brain, see *Meningitis;* of the lungs, see *Pneumonia.*

Inflection (in-flek'shun; Latin, *inflexio*, a bending), in grammar, the changes in form which words undergo in consequence of standing in certain relations to other words in a sentence. These changes occur for the most part at the end of words, and the inflectional elements were all probably at first separate vocables. To inflection belong those changes which comprise cases, numbers, persons, tenses, etc. In some languages we have positive proof of inflections being formed of words originally distinct. Thus Fr. *aimerai*, I shall love, the future of *aimer*, to love, is, literally and historically, I have to love, and is compounded of *aimer*, to love, and *ai*, I have, the first person present indicative of *avoir*. The same is the case in Italian and Spanish. The loss of inflections is a common feature of the Romance tongues as compared with the Latin, on which they are based, and is also a feature of English as compared with Anglo-Saxon. The result in both cases is much less freedom in the arrangement of words, but this is probably counterbalanced by greater perspicuity.

Inflorescence (in-flor-es'ens), in botany, the mode of flowering of any species of plant, that is, the manner in which its blossoms are grouped together, and in some cases in which they are successively open. The

Varieties of Inflorescence.

1, Spike. 2, Amentum or Catkin. 3, Raceme. 4, Panicle. 5, Whorl. 6, Umbel—*a*, simple, *b*, compound. 7, Cyme. 8, Corymb. 9, Thyrsus. 10, Head or Capitulum. 11, Fasciculus or Fascicle. 12, Spadix. 13, Anthodium.

principal forms of inflorescence are the *amentum*, *corymb*, *cyme*, *raceme*, *panicle*, *thyrsus*, *spike* *whorl* (see those terms); *centrifugal* and *centripetal* are also terms applied to two kinds of inflorescence.

Influenza (in-flō-en'za; Italian, influence), a term used to denote an epidemic catarrh of a rather severe character, the symptoms of which are those of what is usually called a cold, with others such as lassitude and general depression, loss of sleep, feverishness, nausea, loss of appetite, sometimes vomiting, often an inflammatory state of the throat and pharynx, bronchitis, or other complications. It is not usually fatal, the patient generally recovering in a week or ten days, but it sometimes leaves behind chronic bronchitis or consumption. An infectious form of influenza, known under the name of la grippe, has at intervals spread extensively. An epidemic of it began in the United States about 1890, and since that date it has never quite ceased, occasionally breaking out severely. It is very apt to leave the patient with some organic weakness. In 1918 a form of the disease known as *Spanish Influenza* swept over the world, with fatalities estimated at 6,000,000. Spain, India, Great Britain and America were the chief sufferers.

Information (in-for-mā'shun), in law, a complaint or accusation exhibited against a person for some criminal offence. It differs in no respect from an indictment, except that it is filed at the mere discretion of the proper law officer of the government, *ex officio*, without the intervention of a grand jury. The process has not been put in motion by Congress for misdemeanor, but is common in civil prosecutions, for penalties and forfeitures. The information is usually made upon knowledge given by some other person than the officer, called the *relator*. The term also denotes a written statement made on oath before a justice of the peace previous to the issuing of a summons or complaint against a person.

Informer (in-for'mėr), in law, a person who informs or prefers an accusation against another, whom he suspects of the violation of some peral statute. When the informer is entitled to the penalty or part of the penalty, upon the conviction of an offender, he is or he is not a competent witness, according as the statute creating the penalty has or has not made him so. The early legislation in England, granting rewards to informers, gave rise to the most flagrant abuses, and police officers made a trade of seducing poor, ignorant persons to the commission of crimes, especially the issuing of counterfeit money, to gain the reward.

Infusion (in-fū'zhun), a solution of some vegetable substance in hot or cold water, such as are often used for medicinal purposes. The water employed may be at boiling heat, but if the substance is itself boiled the result is a *decoction*. In preparing certain infusions cold water is preferable, as bringing out the constituent desired. The process of making an infusion is much the same as that of making tea.

Infusoria (in-fū-sō'ri-a), a class of minute, mostly microscopic, animals, so named from being frequently developed in organic infusions, provisionally regarded as the highest class of the Protozoa. They are provided with a mouth, are destitute of pseudopodia, but are furnished with vibratile cilia. Most are free-swimming, but some form colonies by budding, and are fixed to a solid object in their adult condition. The body consists of outer transparent cuticle, a layer of firm sarcode called the cortical

layer, and a central mass of semiliquid sarcode which acts as a stomach. A nucleus, having attached to its outside a spherical particle called the nucleolus, is embedded in the cortical layer. Contrac-

MAGNIFIED DROP OF WATER SHOWING INFUSORIA, ETC.

1, Volvox globator (a plant, a low form of Alga). 2, Stentor polymorphus. 3, Urceolaris scyphina. 4, Stylonychia mytilus. 5, Zodespermos Ferussaci. 6, Trichoda carinum. 7, Monas termo. 8, Pandorina morum. 9, Bursaria truncatella. 10, Vaginicola crystallina. 11, Cercaria gibba. 12, Zodespermos decumanus. 13, Amphileptus fasciola. 14, Vorticella convallaria. 15, Euptotes truncatus. 16, Trachelocerca olor.

tions of the body are effected by sarcode fibers. The cilia, with which most are furnished, are not only organs of locomotion, but form currents by which food is carried into the mouth. Reproduction takes place variously. They are divided into three orders, Ciliata, Suctoria, and Flagellata, in accordance with the character of their cilia or contractile filaments. Many of the organisms formerly included among Infusoria are now regarded as vegetable.

Ingalls (ing'gâlz), JOHN JAMES, statesman, was born in Middleton, Massachusetts, in 1833. He removed to Atchison, Kansas, in 1858, and was elected to the State Senate in 1862. From 1873 to 1890 he was a United States Senator, and attained a wide reputation as an orator. He was president pro tem. of the Senate during his last three years of service. He died in 1900.

Ingelow (in'je-lō), JEAN, an English poetess, born in 1830; died in 1897. In 1863 she published a volume of poems, which ran through fourteen editions in five years, and her popularity afterward increased both through her prose writings and her poetry. In prose she wrote novels and tales for children, including *Mopsa the Fairy*, *Studies for Stories*, *Off the Skelligs*, *Sarah de Berenger*, *Don John*, etc. Her *High Tide on the Coast of Lincolnshire, 1571*, was her most famous poem.

Ingemann (ing'e-man), BERNHARD SEVERIN, a Danish poet and novelist, born in 1789; died in 1862. After attaining distinction by his lyric narrative and dramatic poetry he traveled in Germany, France, and Italy in 1818-19, and on his return wrote historical romances (taking Scott as his model) illustrative of the habits of his countrymen during the middle ages; some of these have been translated into English.

Ingersoll (in'ger-sol), ERNEST, naturalist, born at Monroe, Michigan, in 1852. He was employed on the Hayden Survey and the Fish Commission, and wrote a number of works, including *Natural History of Nests and Birds*; *Friends Worth Knowing*; *The Ice Queen*; *Wild Neighbors*, etc.

Ingersoll, ROBERT GREEN, orator, born at Dresden, New York, in 1833. He was admitted to the bar in 1854, soon gained distinction as an orator, and engaged in the Civil war as colonel of a cavalry regiment. He became attorney-general of Illinois in 1866, and in 1876, at the Republican National Convention, made a striking oration in favor of the nomination of James G. Blaine as a candidate for the Presidency. For years he lectured against the Christian doctrines, becoming very popular as a lecturer on this and other subjects, but injuring himself in public estimation. He died in 1899.

Inglis (ing'gis), HENRY DAVID, a miscellaneous writer, born at Edinburgh in 1795; died in London, 1835. His works include *Tales of Ardennes* (1825), *Spain in 1830*, *Ireland in 1834*. Of his fictitious works his *New Gil Blas* is the best. Some of his works appeared under the pseudonym of Derwent Conway.

Ingoldsby, THOMAS. See *Barham, R. H.*

Ingolstadt (ing'ol-stât), a fortified town of Bavaria, on the Danube, 35 miles S. W. of Ratisbon. It has an old and a new castle, a fine old Gothic church, a Jesuit college, an arsenal, etc.; manufactures of ordnance and gunpowder, breweries, etc. Ingolstadt had a university of some celebrity, founded in 1472, but in 1800 it was removed to Munich. Pop. 22,207.

Ingot (ing'got), a small bar of metal made of a certain form and size by casting it in moulds. The term is chiefly applied to the small masses or bars of gold and silver intended either for coining or exportation to foreign countries.

Ingres (an-gr), JEAN DOMINIQUE AUGUSTE, a French painter, born in 1781. He studied under David. About 1804 he went to Rome, where he resided for fifteen years, and after a further residence of four years in Florence he succeeded Denon in the School of Fine Arts in Paris, his fame being by this time fully established. In 1833 he succeeded Horace Vernet as director of the French Academy at Rome. In 1834 he was nominated Chevalier, and in 1845 commander of the Legion of Honor. In 1855 he received the grand medal of honor at the International Exhibition, and in 1862 he was made a senator and member of the council of public instruction. He died at Paris in 1867. Among the best known of his numerous pictures are *Bonaparte as First Consul*, *Œdipus and the Sphinx*, *Apotheosis of Homer*, painted in the ceiling of one of the apartments of the Louvre; *Birth of Venus*, *Jesus in the Midst of the Doctors*, *Molière in His Study*, *Virgil Reading His Æneid to Augustus*, etc.

Ingria (in'gri-ȧ), a district of Russia, forming a part of the government of Petrograd, in which the capital, Petrograd, is situated, but at one time belonging to Sweden.

Ingrossing (in-grōs'ing), in law. See *Engrossing*.

Ingulphus (in-gul'fus), or INGULF, Abbot of Croyland, is supposed to have been born in London about 1030. He became a favorite of Edgitha, the wife of Edward the Confessor, who introduced him to William, Duke of Normandy. In 1051 he became his secretary, resigning that office in 1064, when he became a monk in the abbey of Fontenelle, in Normandy, whence he was invited to England by William, and created abbot of the rich monastery of Croyland. He died in 1109. A history of the monastery of Croyland from 664 to 1091 was long attributed to him, but is now believed to be a fabrication of the thirteenth or fourteenth century.

Inhaler (in-hā'ler), an apparatus for inhaling vapors and volatile substances, as steam of hot water, vapor of chloroform, iodine, etc.

Inhambane (in-yām-bā'nā), a Portuguese district and seaport on the east coast of South Africa. There are cocoanut-palm, sugar-cane and rubber plantations, and coffee grows wild. Native pop. of district, 300,000. Pop. of town, 3500.

Inheritance (in-her'i-tans). See *Descent*.

Inheritance Tax. A tax or charge imposed upon the devolution of the property of a deceased person to his heirs or legatees. This is a very old form of taxation, and was first imposed in the Roman Empire to raise money for the support of the army. In England such taxes are known as 'death duties,' and were first imposed about 1780, although a stamp tax existed as early as 1694. Inheritance taxes are now in force in practically all the countries of Europe and in several of the United States. The form and rates of inheritance tax vary in the different states. Generally, however, the tax is graduated according to the amount of property involved, in several states running from 1 to 5 per cent. A federal tax on inheritances was passed by Congress in 1916, the tax being a progressive one, successively increasing from 1 per cent. on $5000 to 10 per cent. on $5,000,000, no deduction being allowed on direct bequests to children or by heads of families as in State inheritance taxes.

In the revenue measures passed in 1917 is a war estate tax, which imposes upon the transfer of each real estate of every decedent dying after the passage of this act, the transfer of which is taxable, etc., taxes graduated from one-half of one per cent of the amount of the net estate not in excess of $50,000, to a rate of ten per cent of the amount by which the net estate exceeds $10,000,000. Exemption is made in respect to estates of those dying while serving in the military or naval forces of the United States during the war existing at the time the act was passed.

In Hoc Signo Vinces (in hŏk sig'nō vin'sēz), (Latin, *In this sign thou shalt conquer*). This legend according to tradition appeared on a flaming cross in the sky to the Roman Emperor Constantine I before his battle with Maxentius.

Inia (in'i-a), a genus of Cetacea belonging to the dolphin family, containing only one known species, *I. geoffroyensis*, about eight feet in length, found in the Amazon.

Initiative and Referendum, a system of legislation by which the people of a state can either initiate measures to be enacted by their own vote into laws, or cause laws enacted by the legislature to be referred to them for approval or rejection. This system prevails in Switzerland and was adopted in South Dakota in 1898, and Oregon in 1902. In the latter state it has been actively applied and with an effect that has led various other states to adopt it, in the form of constitutional amendments. These include Montana in 1906, Oklahoma in 1907, Maine and Mis-

secured in 1908, Arkansas and Colorado in 1910. Several other states have adopted it in partial form and it is growing in popularity. In no other state, however, is it as far reaching in scope as in Oregon, and nowhere else is it in such active operation. The principle of the Initiative and Referendum has been adopted in many cities which have the commission form of government, as an important aid to its efficiency. To it, in some instances, has been added the Recall, a provision which gives the power to recall from office any official with whose conduct the public is dissatisfied. The principle of the Recall as applied to the judiciary is strenuously opposed.

Injections (in-jek'shuns), in surgery, fluids, different, according to the different effects desired to be produced, thrown by means of a small syringe into the natural cavities of the body, or those occasioned by disease. Wounds and sores are usually cleansed in this way when they extend far below the skin. In diseases of the nose, the ears, the bladder and urethra, the uterus, etc., injections are often used. Pure warm water is injected with the highest success for the removal of pus, blood, or even foreign bodies. Sometimes astringent medicines, to restrain excessive evacuations, sometimes stimulating ones, sometimes soothing medicaments, to mitigate pain, etc., are added to the water.

Injector (in-jek'tur), an apparatus for supplying water automatically to steam boilers. Feed pumps for feeding water into boilers are difficult to keep in order when driven at high speed, and some form of injector is now in general use in place of high speed pumps. The principle is to permit steam to escape from the boiler into a chamber supplied with water from without, the steam pressure being sufficient to force this water into the boiler through an aperture opening into its lower part. Injectors are in general use in locomotive boilers, in which the steam pump worked only when the engine was in motion, so that if it stood still for any length of time the water in the boiler was apt to get too low. The injector overcomes this deficiency and keeps the boiler constantly supplied with water when it is making steam.

Injunction (in-jungk'shun), a writ which issues under the seal of a court of equity, to restrain proceedings in other courts, or a prohibitory writ restraining a person or persons from doing some act which appears to be against equity, and the commission of which is not punishable by criminal law. Disobedience to an injunction constitutes contempt of court, punishable accordingly. The free use of the injunction power against labor organizations has of late years given rise to much bitter feeling.

Ink, a liquor or pigment used for writing or printing. All ordinary writing inks owe their properties to the presence of gallate or tannate of iron held in suspension by means of gum. Gall-nuts contain gallotannic acid, which gives a black precipitate with per-salts of iron; they also contain pectose, which converts gallotannic acid, when exposed to the air, into gallic acid. This latter acid colors ferric salts a much deeper black than the former acid. The essential points in the preparation of a good writing ink are therefore the presence of an iron salt, an infusion of gall-nuts and gum, and the allowing the mixture to remain for some time exposed to the air. All other substances which are added to ordinary ink as coloring matters in the place of gall-nuts only impair its quality. As ink is liable to become mouldy it is customary to add a small quantity of such substances as essential oils, carbolic acid, crushed cloves, or sometimes corrosive sublimate, in order to prevent this result. For *copying ink* a little sugar is added, which prevents it drying before a copy can be made. The so-called *alizarin inks differ* from ordinary inks in containing a little free acid, and usually also a small quantity of indigo dissolved in sulphuric acid, which prevents too pale an appearance in writing. Such inks become very black by exposure to ammoniacal fumes. Ink is sometimes prepared in cakes or powder, which when dissolved in water may be used as ordinary ink; the thickening ingredients added are usually madder and indigo dissolved in sulphuric acid. Colored writing-inks, as red, blue, etc., are simply solutions of some coloring materials, cochineal and Brazil-wood being used for red, Prussian blue for blue, etc. Gold and silver inks consist of a fine powder of the metals suspended in a solution of gum-arabic.—*Marking ink* usually consists of a solution of silver nitrate thickened with gum and sometimes colored by means of sap-green.—*Printing ink* may be made by boiling linseed-oil and burning it about a minute, and mixing it with lampblack, with an addition of soap and resin. If it be wished to obtain colored printing inks, this may be done by adding the necessary pigments to the oil while it is being heated. Vermilion is used to give a red color, ultramarine for blues, and lead chromate for yellows.—*Lithographic ink*,

used in printing from the stone, is usually composed of virgin wax, dry white soap, tallow or lard, shellac, mastic, and lamp or Paris black.—*Sympathetic inks* have been sometimes used in secret correspondence. They are of various kinds. For instance, characters written in solutions of cobalt, lemon juice, and dilute sulphuric acid make no appearance on the paper, but become visible when treated with some other solution or exposed to the action of heat.

Inkberry or WINTERBERRY (*Ilex glabra*, an evergreen shrub belonging to the holly family *Ilicinæ* with glossy leathery leaves and black berries. The pokeweed is also called by this name.

Inland Waterways. The outbreak of the European war in 1914 focused the attention of the people of the United States on the question of inland waterways, which, in the matter of national defense are indispensable to the rapid mobilization of fleets at menaced points. It gave fresh vigor to the scheme of co-ordinating the canals and waterways from north to south along the Atlantic coast. The first link of the chain connects the Boston Navy Yard with the New York Navy Yard by way of the Cape Cod Canal and Long Island Sound; the second link connecting the New York Navy Yard with the Philadelphia Navy Yard will follow the line of the antiquated Delaware and Raritan Canal; and the third, connecting the Philadelphia Navy Yard with the Navy Yard at Norfolk, is traced by the Delaware and Chesapeake Canal, which is to be improved to a ship's canal depth.

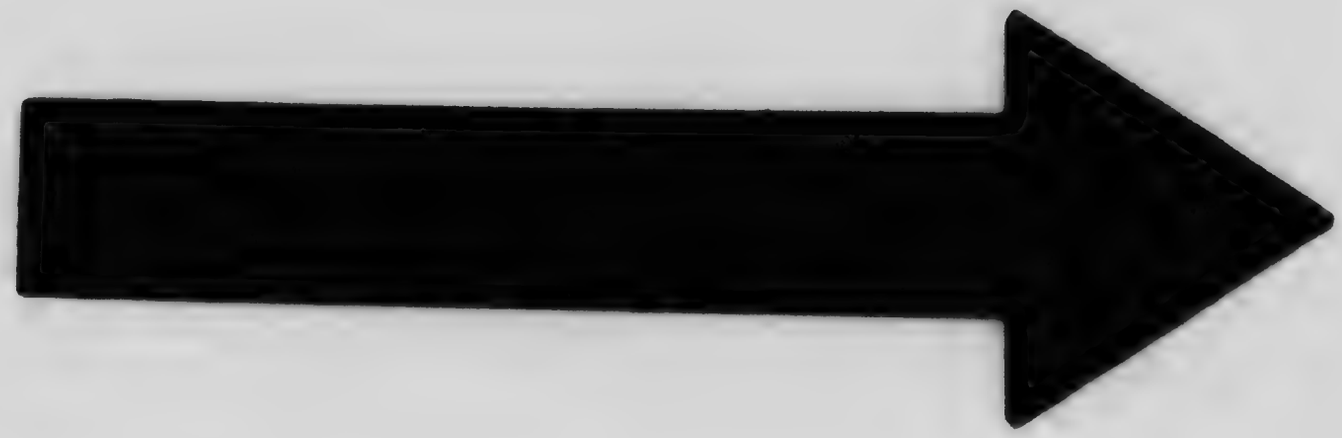
Apart from this Atlantic Intra-Coastal Route there are many other waterways in the country which have been of great service in the transportation of commerce. Chief of these are the Erie Canal connecting the Hudson River at Albany and Troy with Lake Erie at Buffalo, deepened and improved from time to time till the completion of the New York State Barge Canal in 1918; the Florida Coast Line Canal, from Mayport, Fla., to Miami, Fla., a distance of 370 miles; the Miami and Erie, from Cincinnati to Toledo, Ohio; the Chesapeake and Ohio Canal, from Cumberland, Md., to Washington, D. C. In 1917 a Committee on Inland Water Transportation was organized for the movement of freight on the Mississippi and its tributaries, the ultimate object being the establishing of barge lines between New Orleans, St. Louis and the Twin Cities. See *Canals*.

Inlaying (in-la'ing), is the art of ornamenting flat surfaces of one substance by inserting into cavities cut in them pieces of some other substance. Various kinds of metal or wood, or pearl, ivory, etc., are employed in this process. See articles on *Marquetry*, *Damaskeening*, *Buhl*, *Reisnerwerk*, *Pietradura*, *Bidery*, *Mosaic*.

Inn, a house where travelers are sheltered for the profit of the provider. As a protection landlords have a lien on the goods of their lodgers (with the exception of the clothing which they are actually wearing), so that they may retain them as security for the price of their lodging and entertainment. The modern hotel is in a legal sense an inn.

Inness (in'nes), GEORGE, landscape painter, was born at Newburgh, New York, in 1825. No painter has represented the aspects of nature in the American climate with deeper feeling, a finer sentiment of light and color, or a better command of technical resources. His *American Sunset* was selected as a representative work of American art for the Paris Exposition of 1867. He died in 1894.

Innocent (in'u-sent), the name of thirteen popes, of whom only the following need be particularly dealt with:—INNOCENT I, succeeded Anastasius I as Bishop of Rome in 402. He supported St. Chrysostom, and renounced the communion with the Eastern churches on account of their treatment of that eminent man. In 409 he was sent to obtain terms of peace from Alaric, but without success. He died in 417, and is one of the most distinguished saints, his day being July 28.—INNOCENT II, a Roman of noble birth, elected pope in 1130 by a part of the cardinals, while the others elected Peter of Leon, who took the name of Anacletus. Innocent fled to France, where he was acknowledged by Louis VI and by Henry II of England; also by the Emperor Lothaire, who conducted him in 1133 to Rome, where Anacletus also maintained his claims as pope. Innocent was obliged to retire, and though reinstated in 1137 Anacletus maintained himself until his death in 1138. Innocent in 1139 held the second Œcumenical Council in the Lateran, which condemned the opinions of Arnold of Brescia, and declared the decrees of Anacletus null. Innocent died in 1143.—INNOCENT III. Lothario, Count of Segni, born in 1161, was unanimously elected pope at the age of thirty-seven. He displayed great energy, and much enhanced the papal power. He excommunicated Philip Augustus, King of France, and laid his kingdom under an interdict in 1200 because Philip had repudiated his wife, and obliged the king to submit. He extorted a similar submis-



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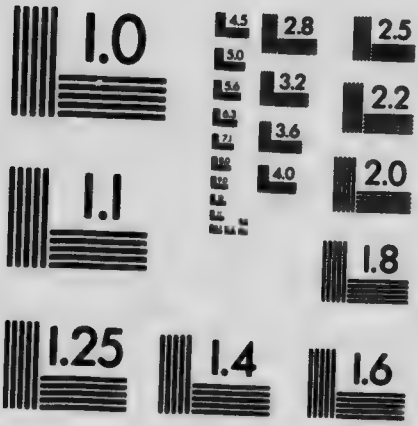

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sion from John, king of England, who refused to confirm the election of Langton as Archbishop of Canterbury, by laying the kingdom under an interdict, and in 1212 formally deposing him. Almost all Christendom was now subject to the pope, two Crusades were undertaken at his order, and his influence extended even to Constantinople. The movement against the Albigenses and establishment in 1198 of the inquisitorial tribunals, from which the Inquisition itself originated, were noteworthy events of his pontificate. In 1215 he held a council by which transubstantiation and auricular confession were reaffirmed as dogmas, and the Franciscan and Dominican orders were confirmed. Innocent died in 1216. He left various works on legal and theological subjects; and the *Stabat Mater*, *Veni Sancte Spiritus*, and other sacred hymns, are said to have been written by him.—INNOCENT XI, Benedetto Odescalchi, born in 1611, served in his youth as a soldier, took orders at a later period, and rose through many important posts, until he was elected pope in 1676, on the death of Clement X. He was eminent for probity and austerity. Though hostile to the Jesuits, whose opinions he attacked in the decree *Super quibusdam axiomatis moralibus*, yet he was obliged to condemn Molinus and the Quietists. Being involved in a dispute with Louis XIV, the authority of the pope in France and elsewhere received a severe blow in the *IV Propositiones Cleri Gallicani* (Four Propositions of the Gallican clergy, 1682). These disputes were highly favorable to the English Revolution, as it induced the pope in 1689 to unite with the allies against James II, in order to lower the influence of Louis XIV. He died in 1689, and was succeeded by Alexander VIII.

Innocents, FEAST OF HOLY, variously styled Innocents' Day and Childermas, a festival observed in the Western Church (including the Anglican) on the 28th, and in the Eastern Church on the 29th December, in commemoration of the massacre of the children at Bethlehem by the order of Herod.

Innsbruck (ins'prook), a town of Austria, capital of the Tyrol, beautifully situated on the Inn, near the confluence of the Sill, surrounded by striking groups of lofty mountains. Among the chief buildings are the Hofkirche or Franciscan Church, containing the splendid tomb of the Emperor Maximilian I and the tomb of Hofer; the church of St. James; the imperial castle or palace; the Golden Roof, a sort of oriel window roofed with gilt copper, and projecting in front of a building originally a palace of Count Frederick of Tyrol; the town-house; the Capuchin monastery; the university; and the provincial museum. It has manufactures of textiles, substitutes for coffee, etc. Pop. 53,194.

Inns of Chancery, in London, nine institutions named Thavie's Inn, New Inn, Symond's Inn, Clement's Inn, Clifford's Inn, Staple's Inn, Lyon's Inn, and Barnard's Inn, formerly preparatory colleges for law students.

Inns of Court, four very ancient societies in London exclusively invested with the right to call to the English bar; also the buildings belonging to these societies, in which the members dine and barristers have chambers. The gentlemen belonging to these societies may be divided into benchers, outer barristers, inner barristers, and students. The benchers are the highest in rank, being usually Queen's Counsel, and it is they who have the right of granting or refusing a call to the bar, or of disbarring persons unfit to practise. The four inns of court are the Inner Temple and Middle Temple (formerly the dwelling of the knights templar, and purchased by some professors of law more than three centuries since); Lincoln's Inn and Gray's Inn (anciently belonging to the earls of Lincoln and Gray). Each inn is self-governing, and all have equal privileges. In each inn building there is a hall, chapel, library, etc., besides sets of chambers occupied by barristers and solicitors. Previously to being called to the bar it is necessary to be admitted a member of one of the inns of court and to go through a certain course of legal study and 'keeping terms.' Any person who has passed a public examination at any university in the British dominions may be at once admitted as a student to any of the inns. Every other person must pass an examination in the English and Latin languages and English history before a joint board appointed by the four inns. No solicitor, parliamentary agent, clerk to justice of the peace, or to any barrister, conveyancer, solicitor, etc., can be admitted as a student until such person ceases to act in any of these capacities and has taken his name off the roll of any court on which it may stand. The educational year is divided into three terms. Attendance is not compulsory on students either at lectures or private classes; nor is it essential to study the practice of law in the chambers of a barrister or pleader, though this is recommended. A term is kept by the student being present at six dinners during the term in the hall of the society to which

he belongs, or three if he is a member of one of the British universities. Students are required to pass an examination in Jurisprudence, Roman Civil Law, Constitutional Law and Legal History, the Law of Real and Personal History, Common Law, Equity, and Criminal Law, there being four examinations in each year.

Inoculation (in-ok-ū-lā'shun), in medicine, the introduction, by a surgical operation, of a minute portion of infective matter into contact with the true skin, for the purpose of exciting artificially a milder form of some contagious disease, and thereby protecting the human system against similar attacks in future; keeping in mind, however, that such a process can be only of efficacy in regard to diseases which attack us only once in the course of our lives, such, for instance, as smallpox. The term is chiefly used in connection with smallpox. The practice of inoculation with material taken from a smallpox patient, long followed in parts of Wales, was seemingly scarcely known throughout England till the early part of the eighteenth century, and its adoption was chiefly due to the exertions of Lady Mary Wortley Montagu, who became acquainted with it in Turkey. For many years the practice met with the greatest opposition, both from the medical profession and the clergy; but later it came extensively in vogue, the smallpox thus induced being of a milder and much less often fatal type than ordinary smallpox. The great objection to it was that it tended to spread this serious disease, inoculated smallpox being equally infectious with the other kind. After the discovery of vaccination by Jenner, in 1798, inoculation was gradually superseded, and the British legislature even prohibited the latter, while making vaccination compulsory. See *Smallpox* and *Vaccination*.

Inosite (in'o-sīt; $C_6H_{12}O_6$), a saccharine substance, isomeric with glucose, found in the muscular substance of the heart, in the lungs, kidneys, brain, etc. In 'Bright's disease' it has been found in the urine, and it exists also in several plants.

Inouye, Kaoru, Count, a Japanese statesman, born in the province of Chosku in 1839. He made a secret journey to Europe with Count Ito, serving as a common sailor on the voyage; and on their return they, at the risk of their lives, advocated the adoption of Western methods. After the restoration, in 1868, he was constantly employed by the government, as minister of public works and foreign secretary. He was raised to the peerage in 1885 and made minister of the interior in 1892.

Inowraclaw (ē-nov-rats'läf), or Jung-Bazalau, a town of Prussia, province of Posen. It has large beds of rock-salt and saltpeter-works. Pop. 26,141.

In Partibus Infidelium (literally, 'in parts belonging to infidels'), the title given since the thirteenth century to bishops appointed by the pope in countries where his sway is not recognised, and who, having no proper diocese, take their title from a territory which may have once formed a see, but does no longer; thus Roman Catholic bishops in Britain formerly had such titles as 'Bishop of Nicopolis,' 'Bishop of Anazarba.'

Inquest (in'kwest), See *Coroner*.

Inquisition (in-kwi-si'shun), in the Roman Catholic Church, a court or tribunal established for the examination and punishment of heretics. The institution was founded in the twelfth century by Father Dominic, who was charged by Pope Innocent III with orders to incite Catholic princes and people to oppose heretics. Pope Gregory IX in 1233 completed the design of his predecessors, and the Inquisition was successively introduced into several parts of Italy, and, with certain limitations, into some provinces of France. It never managed to establish itself in England at all. The tribunals of faith were admitted into Spain in the middle of the thirteenth century; but a firm opposition was made to them, particularly in Castile and Leon, and the bishops there maintained their exclusive jurisdiction in spiritual matters. A change, however, afterwards took place; and while in other countries of Europe the Inquisition could never obtain a firm footing—in some falling entirely into disuse, as in France—in Spain it became a political engine towards the end of the fifteenth century, under Ferdinand and Isabella, who used it as a weapon to break the strength of the nobles, and to render the royal authority absolute. In 1477, when several turbulent nobles had been reduced in the southern part of Spain, Queen Isabella went with the Cardinal Pedro Gonzalez de Mendoza to Seville, where this prelate, as Archbishop of Seville, made the first attempt to introduce the Inquisition, especially with regard to citizens of Jewish origin. After this the design was disclosed of extending it over the whole country. In the assembly of the states held at Toledo, 1480, the erection of the new tribunal was urged by the cardinal, and after some oppo-

sition established under the name of the General or Supreme Inquisitor. The new court was opened in Seville in 1481. Torquemada, prior of the Dominican convent at Segovia, and father-confessor to the Cardinal Mendoza, had already been appointed by Ferdinand and Isabella the first grand inquisitor in 1478. The Dominican monastery at Seville soon became insufficient to contain the numerous prisoners, and more than 2000 persons are said to have been burned alive in the first year or two. The pope, however, opposed the establishment of the Spanish Inquisition as the conversion of an ecclesiastical into a secular tribunal, and repeatedly summoned the inquisitor-general to Rome. Torquemada, instead of obeying, sent a friend to defend his cause, and in 1483 Sixtus IV was obliged to yield and acknowledge Torquemada as inquisitor-general of Castile and Leon, and a later bull subjected Aragon, Valencia, and Sicily to the inquisitor-general of Castile. The introduction of the new tribunal was attended with risings and opposition in many places, as at Saragossa, but the people were obliged to yield in the contest. The tribunal was wholly dependent on the Spanish sovereigns, and became a powerful instrument for establishing the arbitrary power of the king on the ruins of the national freedom; for putting down the clergy, who had previously acknowledged only the jurisdiction of the Roman see; and for oppressing the nobles, and taking away the privileges of the estates. The property of those who were condemned fell to the king; and, although it had been granted to the Inquisition, it was still at his disposal. Ferdinand and Isabella, indeed, devoted a part of this property to found convents and hospitals; but the church, notwithstanding, lost many possessions by means of the Inquisition. It is computed that there were in Spain above 20,000 officers of the Inquisition, called *familiars*, who served as spies and informers. These posts were sought even by persons of rank, on account of the great privileges connected with them. The supreme tribunal, under the inquisitor-general, sat at Madrid. He was assisted by a council of six or seven, and there were various officials belonging to the court, the one specially appointed to carry on prosecutions being called the fiscal. As soon as an accuser appeared, and the fiscal had called upon the court to exercise their authority, an order was issued to seize the accused. If he did not appear at the third summons he was excommunicated. From the moment that the prisoner was in the power of the court he was cut off from the world. The advocate who was appointed to defend him could not speak to him except in the presence of the inquisitors. The accused was not confronted with the accuser nor the witnesses before the court, neither were they made known to him; and he was often subjected to the torture to extort a confession, or to explain circumstances which had not been fully explained by the witnesses. Imprisonment, often for life, scourging, and the loss of property, were the punishments to which the penitent was subjected. Wearing the *san-benito*, or vest of penitence,—a sort of coarse yellow tunic, with a cross on the breast and back, and painted over with devils—was a common method of punishment, the penitent having to wear it for a fixed period. When sentence of death was pronounced against the accused the *auto da fe*, or ceremony of burning the heretic in public, was ordered. This usually took place on Sunday, between Trinity Sunday and Advent. As 'the church never pollutes herself with blood,' a servant of the Inquisition, at the close of the procession and ecclesiastical ceremonial preceding the execution of the sentence, gave each of those who had been sentenced a blow with the hand, to signify that the Inquisition had no longer any power over them, and that the victims were abandoned (*relaxados*) to the secular arm. A civil officer, 'who was affectionately charged to treat them kindly and mercifully,' now received the condemned, bound them with chains, and led them to the place of execution. They were then asked in what faith they would die. Those who answered the Catholic were first strangled; the rest were burned alive. Even in more modern times the original organization of the Inquisition was but little changed, but the *auto da fe* was seldom witnessed after the sixteenth century. The powers of the court latterly became more limited, however, by various restrictions, and at last, under Joseph Bonaparte, it was abolished altogether in 1808. It was reëstablished in 1814 by Ferdinand VII. but on the adoption of the constitution of the Cortes, in 1820, it was again abolished. According to the estimate of its historian, Llorente, the number of victims of the Spanish Inquisition from 1481 to 1808 amounted to 341,021, a gross exaggeration, according to Prescott. Of this number, 32,000 were burned.

The Inquisition, abolished for Italy by Napoleon in 1808, restored in Rome by Pius VII in 1814, still exists, nominally at least, as one of the 'congregations.' The censorship of the press was under it.

Insanity (in-san'i-ti), a general term comprising every form of intellectual disorder, whether consisting in a total want or alienation of understanding, as in idiocy, or in the diseased state of one or several of the faculties. Medical writers have adopted different systems of classification in their treatment of this subject; but perhaps the most convenient is that which comprises all mental diseases under the four heads of mania, melancholy, dementia or fatuity, and idiocy. *Idiocy* is either a congenital or an acquired defect of the intellectual faculties. Congenital idiocy may originate from a malformation of the cranium, or of the brain itself. Acquired idiocy proceeds from mechanical injury of the cranium, or from injury or disease of the brain, from excess in sensual indulgences, etc. (See *Idiot.*) *Dementia* is marked confusion of thoughts, loss of memory, childishness, a diminution or loss of the powers of volition, and general weak-mindedness; it differs from idiocy in being curable. *Cretinism*, sometimes given as a separate category, is a form of idiocy associated with a characteristic malformation of the body. *Mania* is a species of mental derangement characterized by the disorder of one or several of the faculties, or by a blind impulse to acts of fury. Adults are the principal subjects. Females are more exposed to it than males. Violent emotions, a dissipated life, excess in any indulgence, sometimes produce it. It is sometimes cured, but sometimes remains stationary, and sometimes is converted into dementia. *Melancholy* is a species of mental disorder consisting in a depression of spirits. Some dark or mournful idea occupies the mind exclusively, so that by degrees it becomes unable to judge rightly of existing circumstances, and the faculties are disturbed in their functions. Several kinds of melancholy are distinguished; the distinctions are founded, however, mostly on the causes of the disease, among the more important of which are love, religious views, repeated failures to reach an earnestly desired end, a sudden nervous shock, and the like. The course of the disease is various; sometimes it lasts a series of years; sometimes it ceases of itself, or is cured by medical aid. Very frequently melancholic patients commit suicide, a tendency that is not to be overlooked. In it also bodily health is likely to be neglected, thus leading to certain other diseases. See *Lunatic Asylum*, *Lunacy*, *Non compos mentis*, etc.

Inscriptions, records, not of the nature, of a book, engraved or inscribed on stone, metal, clay, or other durable material. Inscriptions of this kind remain in many cases our sole source of knowledge of long periods of ancient history. Probably more than 150,000 inscriptions have been found of varied character, and an extensive literature has grown up around them. Very many of them are mortuary epitaphs. Far more important are records of events in the history of kings, commercial contracts and religious inscriptions.

Insecticides (in-sek'ti-sīdz), substances, not necessarily poisonous, used to prevent or destroy the insect enemies of plants. Biting or gnawing insects are destroyed by mixtures of arsenic, such as Paris green, arsenate of lead, and London purple; sucking insects by suffocating substances, such as soap, sulphur and hyrocyanic-acid gas.

Insectivora (in-sek-tiv'o-ra), an order of mammals living to a great extent on insects. They are plantigrade, and have a well-developed clavicle, a discoidal placenta, incisor teeth larger than the canine, and molar teeth set with sharp conical cusps. They are usually of small size, and many of them live underground. They are found throughout the world, with the exception of Australia and South America. The chief insectivorous families are the Talpidæ or moles, the Soricidæ or shrew-mice, and the Erinaceidæ or hedgehogs.

Insectivorous Plants, plants which derive nourishment from the insects entrapped by them. See *Dionæa*, *Sundew*, *Pitcher-plant*.

Insects. See *Entomology*.

Insertion (in-sėr'shun), in botany, the place or mode of attachment of an organ to its support. Insertion is described as *epigynous* when on the summit of the ovary, *hypogynous* when beneath the ovary, and *perigynous* when upon the calyx surrounding the ovary.

Insessores (in-se-sō'rēz), in ornithology, the perchers or passerine birds, an extensive order of birds, comprehending all those which live habitually among trees, with the exception of the birds of prey and the climbing birds. The toes, which are three before and one behind, are specially adapted for perching and nest-building. These birds live in pairs, build in trees, and generally display great art in the construction of their nests. In them the organ of the voice attains its utmost complexity, and all our singing birds belong to the order. The form of the beak varies widely, and this has led to the establishment of four

important subordinate groups. (1) The *Conirostres*, or 'conical-beaked' Insessores; (2) The *Dentirostres* or 'tooth-beaked' perchers; (3) The *Tenuirostres*, or slender-beaked perchers; (4) The *Fissirostres*, or cleft-beak (swallows, swifts, goat-suckers, etc.). In modern classifications the Fissirostres are generally excluded from the order, which is also divided otherwise. Two main divisions, the *Acromyodi* or singing-birds and the *Mesomyodi* or songless birds, are now generally recognized, the distinctive characters being based on the structure of the larynx. The former, again, are divided into the *Turdiformes*, or thrush-like birds; the *Fringilliformes*, or finch-like birds; and the *Sturniformes*, or starling-like birds. See also *Ornithology*.

A, Head of Hoopoe (*Upupa epops*), showing the tenuirostral type of beak. B, Head of Red-backed Shrike (*Lanius collurio*), showing the dentirostral type of beak. C, Head of White-bellied Swift (*Cypselus melba*), showing the fissirostral type of beak. D, Head of Corn-bunting (*Emberiza miliaria*), showing the conirostral type of beak. E, Foot of the Yellow Wagtail (*Motacilla sulphurea*). F, Foot of a Finch (*Fringilla*).

Insignia (in-sig'ni-a), the name given to all outward marks of power and dignity, such as the golden crown, the ivory chair, and the twelve lictors with their axes in the time of the Roman kings; the crowns and sceptres of European monarchs; the pallium, the infula, the staff, and ring of the higher orders of the Roman Catholic priesthood. The name of insignia is also applied to the decorations worn by the different orders of merit.

Insolvency (in-solv'en-si). See *Bankrupt*.

Inspiration (in-spi-rā'shun), in theology, is the infusion of ideas into the human mind by the Holy Spirit. By the *inspiration of the Scriptures* is meant the influence of the Holy Spirit exercised on the understandings, imaginations, memories, and other mental faculties of the writers, by means of which they were qualified for communicating to the world divine revelation, or the knowledge of the will of God. Theological writers have enumerated several kinds or degrees of inspiration, which are founded upon the supposition that God imparted to the sacred penmen that measure and degree of assistance which was just suited to the nature of the subjects which they committed to writing, and did not supersede the use of their natural powers and faculties, and of their acquired knowledge, where these were sufficient. Thus distinctions have been drawn between inspiration of direction, inspiration of superintendency, inspiration of elevation, and inspiration of suggestion. All orthodox theologians agree in ascribing divine assistance to the scriptural writers, but differ widely as to the degree, extent, and mode of inspiration. The advocates of *plenary* inspiration assert that every verse of the Bible, every word of it, every syllable, every letter is the direct utterance of the Most High. In opposition to this theory some writers confine inspiration to all that is directly religious in the Bible, to all that is matter of direct revelation, leaving out of the question all that can be known by ordinary intellectual application. Other authorities attribute inspiration only to the spirit, ideas, or doctrines of the Scriptures, exempting the strict form or letter. Some go yet further, and include in the fallible sections the mode of argument and expository details.

Insterburg (ēn'ster-burg), a town of Prussia, province of East Prussia, 16 miles west from Gumbinnen, at the confluence of the Angerap and Inster, which here form the Pregel. It has iron-foundries, distilling, brewing, manufactures of linen, leather, and earthenware, etc. Pop. (1910) 31,627.

Instinct (in'stinkt), the power by which, independently of all instruction or experience, and without deliberation, animals are directed to do spontaneously whatever is necessary for the preservation of the individual, or the continuation of the kind. Three main

theories have been held with regard to instinctive actions:—(1) That these various impulses and faculties were bestowed by the Creator upon each species as its necessary and characteristic outfit. (2) That instinct is the accumulated results of individual experience, fixed by repetition, and transmitted as an inheritance to succeeding races. In this view instinct is intelligent in its origin, an organised experience, a 'lapsed intelligence.' (3) That the greater number of complex instincts arise through the natural selection of variations of simpler instinctive actions—variations arising from unknown causes. The last theory is that of Darwin.

Institute of France (in-sti-tūt), the principal philosophical and literary society of France, organised after the first storm of the French Revolution in 1795, to replace the Académie Française, the Académie des Sciences, and the Académie des Belles Lettres et Inscriptions, its object being the advancement of the arts and sciences. The Institute now embraces five distinct divisions or *académies*, each having a separate field of knowledge or thought: (1) The *Académie Française*, originally established early in the seventeenth century. Its department is the French language and literature, and its ordinary members number 40. (2) The *Académie des Inscriptions et Belles Lettres*; ordinary members, 40. (3) The *Académie des Sciences*; ordinary members, 65. (4) The *Académie des Beaux Arts*; ordinary members, 40. (5) The *Académie des Sciences, Morales, et Politiques*; ordinary members 40. Each academy has an independent organization and a free disposition of the funds committed to it. Members are elected for life by ballot, and have an annual salary of 1500 francs. To each academy are attached a certain number of honorary members and foreign associates. Admission into the Académie Française is a great object of ambition with most French literary men. The name of this distinguished body was changed in 1848 to *Institut National de France*, having previously been called *National*, *Imperial*, and *Royal* at different times.

Institute for Medical Research, an important institution founded in New York by John D. Rockefeller, and endowed by him with funds amounting in all to $8,400,000. Its purpose, as at present constituted, is that of research into the causes of obscure diseases, and it seems calculated to prove of immense benefit. A new hospital has been added to it, with 70 beds, to be confined to those suffering from specified diseases which are under special examination by the faculty. At present these are confined to infantile paralysis, pneumonia and heart disease, in order that an exhaustive study of these diseases may be made.

Institutes, a book of elements or principles; particularly a work containing the principles of a system of jurisprudence; as the *Institutes* of Justinian; the *Institutes* of Gaius; Erskine's *Institutes* of the Law of Scotland.

Instrument (in'strö-ment), in music, any mechanical contrivance for the production of musical sound. Musical instruments are divided into three kinds—wind-instruments, stringed instruments, and instruments of percussion. The chief modern stringed instruments are the violin, viola, violoncello, and double bass, the harp, mandolin, guitar, and piano; the chief wind-instruments, the flute, oboe, bassoon, clarinet, basset-horn, serpent horn, trumpet, trombone, ophicleide, and organ; the chief percussion instruments, the drum, tambourine, cymbals, and triangle.

Instrumental Music, music produced by *instruments*, as contradistinguished from *vocal* music. Instrumentation is quite a modern art, and may be said to have been first cultivated to any purpose among the Italians, who up until the middle of eighteenth century, however, used only instruments of the viol kind, and who even yet are sparing in their use of wind instruments. In Italy, Leo, Durante, Jomelli, and Majo; in France, Rameau; in Germany, Haydn and Mozart, deserve the credit of carrying the art to a perfection up to their time undreamed of. Further developments of an important character are due to Berlioz and Wagner.

Insulator (in'sū-lā-tur), a body used to separate an electrified conductor from other bodies, and which offers very great resistance to the passage of electricity. Glass, shellac, resins, sulphur, ebonite, gutta-percha, silk, and baked wood are notable insulating materials. The cut shows the usual forms of insulators in telegraph lines to support the wires on the posts. They are usually made of porcelain or glass.

Insulator.

Insurance (in-shör'ans), is a contract whereby, for a stipulated consideration, called a *premium*,

one party undertakes to indemnify another against certain risks. The party undertaking to make the indemnity is called the *insurer* or *underwriter*, and the one to be indemnified the *assured* or *insured*. The instrument by which the contract is made is denominated a *policy;* the events or causes of loss insured against, *risks* or *perils;* and the thing insured, the *subject* or *insurable interest*. *Marine* insurance relates to property and risks at sea; insurance of property on shore against fire is called *fire* insurance. *Life* insurance, in its widest sense, is a contract entered into by the insurer to pay a certain benefit contingent upon the duration of one or more lives. Besides these classes of insurance there are many others: the traveler may insure himself against loss entailed from damage by rail or sea; the farmer from the inroads of disease among his live stock; the employer from the fraud of a dishonest cashier, etc. Our attention will, however, be confined to the first three divisions.

The practice of marine insurance seems to have long preceded insurances against fire and upon lives, and probably dates from the end of the fourteenth or beginning of the fifteenth century. It is, however, contended, on the authority of Livy, that traces of the practice may be found during the second Punic war, while other writers, founding on a passage of Suetonius, ascribe the introduction of the principle to the Emperor Claudius. Nearer our own day, there are extant rules of sundry guilds or social corporations of the Anglo-Saxons, whereby, in consideration of certain contributions, the members guarantee each other against loss from fire, water, robbery, or other calamity. Insurance, viewed in its commercial aspect, however, seems to have been first undertaken in Flanders. It is probable, from a statement in 43 Eliz. chap. xii, that insurance was introduced into England by the Lombards early in the sixteenth century.

While all fire and life assurances are made at the risk of companies which contain within themselves the requisites of security, wealth, and numbers, a large proportion of marine insurances is made at the risk of individuals called underwriters. The London underwriters form an influential society known as Lloyd's. As a small number of risks would not secure a safe average to the individual insurer, owing to the great hazard property at sea is exposed to, he prudently takes but a fractional part of the entire risk on himself, and this is effected by subscribing or *underwriting* the stipulated proportion on a policy drawn out for the entire sum to be covered. The necessity for circulating the policy and negotiating the insurance has given rise to the business of the *insurance broker*, with which, however, that of the underwriter is frequently combined. Policies are either *valued*, where the insurance is based on a specific bill of lading, or *open*, where in the case of loss, the value of a vessel with her stores is estimated as at the date of sailing, her freight at the amount she would have earned had the voyage been successfully accomplished, and her cargo at its invoice price, adding premium and all charges. The losses against which the insured is not protected are:—1. Acts of the government, such as the destruction of goods in quarantine. 2. Breach of the revenue laws. 3. Consequences of deviation from the terms of the policy. 4. Breaches of the law of nations, such as failure in attempting to run a blockade. 5. Unseaworthiness, or incompetency of the master. 6. Loss arising from unusual protraction of the voyage. 7. Liability for doing damage to other vessels. 8. Average (which see).

Fire insurance is a contract of indemnity by which the insurer, in consideration of a certain premium, undertakes to indemnify against all loss or damage in buildings, stock, goods, etc., by fire during a certain period. Insurances of this nature are hardly ever made by individuals, but almost invariably by corporations and joint-stock companies. Fire insurance has been practised in Britain for nearly two centuries, but was introduced considerably later on the European continent and in America. At an early period after its institution it was considered in Britain a legitimate subject for taxation, the tax, however, being abolished in 1869. No such tax has ever been imposed in the United States. Insurances are generally divided into common, hazardous, and doubly hazardous, the premium increasing with the degree of risk. Nothing can be recovered from the insurers in the event of loss unless the party insuring had an interest or property in the subject insured at the time the insurance was effected and when the fire happened. Sometimes no single office will insure to the required amount; in such a case it is done by different offices. Fire insurance being a contract of indemnity, it is only the actual loss that can be recovered. The premises must not be materially altered, except by arrangement, during the risk, otherwise the policy will be void. The policy will also be vitiated should there be any misrepresentation or omission in the description of the subject insured, and the insurers do not hold themselves liable

for loss or damage by foreign enemy, riot, civil commotion, or military or usurped power.

Life insurance is a much simpler contract in many respects than either of the preceding. There can be but one loss, that caused by death, and therefore there is no partial loss nor average. The rate of 3 per cent. has generally been adopted as a basis for the calculation of premiums. Life insurance companies are divided into three classes. The first consists of corporations or joint-stock companies, who undertake to pay fixed sums upon the death of the party insuring with them; the profits of such societies are wholly divided among the proprietors. The second class is formed on the basis of mutual insurance, the members themselves being the company, and liable to each other for all claims, the profit accruing therefrom being from time to time allotted to the insured, generally in the form of bonuses. The third class, or mixed companies, are proprietary companies charging such increased rates as will yield a bonus, but which, in return for the working expenses and guarantee of their capital, reserve a stipulated portion of their profits for their proprietors. It is impossible to say with certainty which is the preferable form. Life insurance not being a contract of indemnity, a person may insure in as many offices as he likes, and his executors will recover the full amount from each of the insurers. It is legal for a wife to insure her husband's life, as she is dependent upon him for support; or for a husband to insure his wife's if she has an annuity or property settled upon her for life in which he has an interest; or for a creditor to insure his debtor's life. The policy is void where obtained by false representations. Life insurances are often assigned as a security for debt; the assigner binds himself to pay the premiums. Every life insurance company is bound to prepare a yearly statement of its revenue and of its balance-sheet according to prescribed forms, and must cause certain periodical investigations to be made into its affairs, and prepare and furnish to shareholders and policyholders periodical statements of its business.

Government Insurance. A Bureau of War Risk Insurance was created by act of Congress on September 2, 1914, insuring American vessels and their cargoes against the risks of war. Insurance was extended to cover the masters, officers and crews in June, 1917. A still further extension of the activities of the bureau was embodied in the War Risk Insurance Bill passed by Congress on October 6, 1917, providing insurance for all persons in any branch of the military service of the nation. The law provided that soldiers and sailors might apply for insurance in multiples of $500 for any sum not exceeding $10,000 for each applicant on a yearly-renewable-term basis. The premiums, payable monthly, are graded according to age, and average $8 per $1000 per year. The insurance, which is not compulsory, provides for either death or disability.

Intaglio (in-tăl'yō; Ital., from *intagliare* to incise, cut into), a precious stone or gem in which the subject is hollowed out so that an impression from it would present the appearance of a bas-relief. The word is applied to a new method of newspaper printing, introduced into America from Germany, also called the Mertens process. In ordinary processes newspaper illustrations are printed from lines of type upon whose *raised* dots, previously inked, a sheet of paper is pressed, carrying away an inked impression; but by the intaglio process the printing is done from the surface of infinitely minute depressions.

Interdict (in'tẽr-dikt), an ecclesiastical censure in the Roman Catholic Church, the effect of which, taken in its most extended sense, is, that no kind of divine service is celebrated in the place or country under the sentence; the sacraments are not administered, the dead not buried with the rites of the church. This interdict is called *real* or *local*, while the personal interdict regards only one or more persons.

Interest (in'tẽr-est), the allowance made for the loan or retention of a sum of money which is lent for, or becomes due at, a certain time; this allowance being generally estimated at so much per cent. per annum, that is, so much for the use of $100 for a year. The money lent or forborne is called the *principal;* the sum paid for the use of it, the *interest.* The *rate of interest* is the proportional amount as compared with the principal for the use of money, as six per cent. for 100 cents of principal. Interest is either *simple* or *compound. Simple interest* is that which is allowed upon the principal only, for the whole time of the loan or forbearance. *Compound interest* is that which arises from any sum or principal in a given time by increasing the principal, at fixed periods, by the interest then due, and hence obtaining interest upon both interest and principal. The rate of interest, supposing the security for the principal to be equal, depends obviously upon what may be made by the employment of money in various industrious undertakings, or on the rate of

profit. Where profits are high, interest is high, and *vice versa*; in fact, the rate of interest is simply the net profit on capital. Besides this, however, the interest on each particular loan must further vary according to the supposed risk of the lender, the supposed solvency of the borrower, etc. In Europe formerly the imposition of interest was alternately prohibited and permitted, the clergy being generally unfavorable to the practice. Calvin was among the first to expose the error and impolicy of prohibition. In 1546 it first received a parliamentary sanction in England, and it was fixed at 10 per cent; in 1624 it was reduced to 8, in 1651 to 6, and in 1724 to 5, at which rate it remained till 1854, when all usury acts were repealed. Similar reductions have taken place in the United States, high rates of interest prevailing in newly settled regions and low ones in the older districts, 5 per cent being a common rate in the large cities and thickly settled States.

Interference (in-tėr-fēr'ens), in physics, the mutual action of waves of any kind (whether those in water, or sound, heat, or light waves) upon each other, by which, in certain circumstances, the vibrations and their effects are increased, diminished, or neutralized. When two minute pencils of light, radiating from two different luminous points, and making a small angle with each other, fall upon the same spot of a screen or a piece of paper, it is found that in some cases they illuminate the paper or screen more strongly than either would have done singly, and sometimes they destroy each other's effects and produce a black spot or fringe. Such phenomena have been explained in accordance with the undulatory theory of light, and furnish a strong argument in favor of that theory. The interference of waves of sound is a phenomenon which may be frequently observed in the *beat* of the tones of the heavier organ pipes. Again, to a person situated in the middle of a bell the sound waves from the vibrating segments of the bell interfere and produce only a moderate loudness, whereas to a person at a short distance outside the edge the loudness is intolerable.

Interior, DEPARTMENT OF THE, organized in 1849, one of the administrative departments of the United States government. Its head is the Secretary of the Interior, a member of the Cabinet. It supervises all public lands and patents, education, the census, pensions, the territories, Indian affairs, etc.

Interlaken (in-ter-lăk'en; 'between the lakes'), a village in Switzerland, in the canton, and 26 miles S. E. of Berne, beautifully situated near the left bank of the Aar, between the lakes of Thun and Brienz, much resorted to by tourists. Pop. 3747.

Interlude (in'tėr-lūd), originally an entertainment exhibited on the stage between the acts of a play, or between the play and the afterpiece, to amuse the spectators, while the actors rested or shifted their dress, or the scenes and decorations were changed. In England dramas appear to have borne this name from the time they superseded the miracle and mystery plays till the period of the Elizabethan drama. The name is also given to a brief piece of church music, prepared or extempore, for the organ, and played after each stanza except the last of a metrical psalm or hymn.

Interment (in-tėr'ment). See *Burial*.

Intermezzo (in-tėr-met'so), in dramatic literature, nearly the same as interlude, a short musical piece, generally of a light sparkling character, played between the parts of a more important work, such as an opera, drama, etc. Pieces intended for independent performances are sometimes designated by this name by the French and the Italians.

Intermittent Fever. See *Malaria*.

Internal Revenue, a term used in the United States to designate revenue collected by the government from taxes aside from those on imported goods. The first tax of this kind was laid in 1791 on distilled spirits. Taxes were afterwards laid on carriages and several other articles. On the recommendation of President Jefferson, all internal taxes were repealed in 1802, and no others were authorized until 1813, when the war of 1812 made an increased revenue necessary. After 1818 no such taxes were levied until 1861, when the Civil war compelled a re-enactment of internal-revenue laws. A tax was imposed on a great variety of articles, also on incomes, sales, legacies, etc. By the acts of 1866, 1867 and 1868 many taxes were abolished, but revenue on spirits, tobacco, fermented liquors and a few other articles was continued. In the Spanish-American war, 1898, and the European war, 1914-18, internal revenue was relied on chiefly to meet increased expenditures. In Canada and Great Britain the taxation which corresponds with the American internal revenue is known as *excise* (q. v.). See also *War Revenue*, *Income Tax*, etc.

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